School of Economics and Finance
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An Examination of the Growth of Islamic Banking in Indonesia from 2003 to 2010

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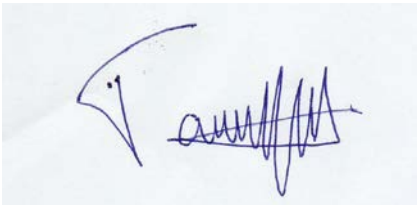
To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature : 

Date : 29 November 2013

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

For Yuli and my Angels.....

إِنَّ فِي خَلْقِ السَّمَاوَاتِ وَالْأَرْضِ وَاخْتِلَافِ اللَّيْلِ وَالنَّهَارِ لَآيَاتٍ لِّأُولِي الْأَلْبَابِ

Behold! in the creation of the heavens and the earth, and the alternation of night and day,- there are indeed Signs for men of understanding,- (Ali Imran: 190)

يَا أَيُّهَا الَّذِينَ آمَنُوا إِذَا قِيلَ لَكُمْ تَفَسَّحُوا فِي الْمَجَالِسِ فَافْسَحُوا يَفْسَحِ اللَّهُ لَكُمْ وَإِذَا قِيلَ انشُزُوا فَانشُزُوا يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

O you who believe! when it is said to you, Make room in (your) assemblies, then make ample room, Allah will give you ample, and when it is said: Rise up, then rise up. Allah will exalt those of you who believe, and those who are given knowledge, in high degrees; and Allah is Aware of what you do. (Al Mujadila: 11)

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Last but not least, the most important people in my life, my family. I love you all!

The dissertation is dedicated to Yuli and my angels.

This thesis has been professionally edited by Dr Margaret Johnson of The Book Doctor in accordance with the guidelines for editing research theses developed by the Institute of Professional Editors and approved by the Deans and Directors of Graduate Studies in 2010.

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ABSTRACT

Islamic banking has grown rapidly, including in Indonesia, where it has grown relatively faster than non-Islamic banking but much slower than predicted by the Central Bank of Indonesia. This study investigates the growth of Indonesian Islamic banks to understand why they have not grown as predicted. It examines whether Indonesian Islamic banks differ from non-Islamic banks in terms of efficiency. A novel aspect of this dissertation is that the analysis of efficiency includes consideration of the different stakeholders that banks serve. This dissertation analyzes the impact of efficiency differences on the total asset growth of Indonesian Islamic banks to examine if differing efficiencies have affected their growth in Indonesia, and presents a detailed analysis of how the components of bank efficiency influence banks' growth.

The empirical research is based on data from 2003–2010. Both financial information (balance sheets and income statements) and non-financial information (number of branches and number of employees) of all Islamic and non-Islamic banks in Indonesia are examined. The combination of financial and non-financial information allows the grouping of variables to determine efficiency by measuring relative stakeholder efficiency, with the application of Constant Returns to Scale and Variable Returns to Scale Data Envelopment Analysis (DEA). By applying the Mann-Whitney test, this research finds significant statistical differences between the efficiency scores of Islamic and non-Islamic banks. Regression analysis is also applied to determine the significance of the different components of stakeholder efficiency with regard to the growth of Islamic banking in Indonesia.

The findings from both DEA efficiency measurement and regression analysis suggest that Islamic banks differ from their non-Islamic counterparts. The findings support the contention that Islamic banks are not doing business only to maximize their profits. Instead, they have social functions, to serve their customers and community. The regression results support the claim of Islamic banks that they focus on performing intermediation activities between borrowers and depositors. The findings also suggest that in order to grow, Islamic banks have to act in ways that customers perceive to be consistent with their social aims.

Many Islamic banks are operating under Decreasing Returns to Scale efficiency, so expansion (growth) will not be to their benefit because of the underlying efficiency issues contributing to growth. The attempts of the Central Bank of Indonesia to improve the growth of Islamic banks by increasing their number of outlets through office channeling is probably not proficient considering the existing Decreasing Returns to Scale performance of the majority of Islamic banks. The findings of this thesis suggest that instead, Islamic banks should improve their stakeholder efficiency to attain sustainable growth.

Chapter 1
INTRODUCTION

1.1 Background to the research

Islamic banking has grown quite rapidly throughout the world, including in Indonesia. Nowadays, they exist not only in countries whose populations are predominantly Muslim, but in countries where Muslims form a minority. In 2007 there were more than 300 Islamic financial institutions and over 250 mutual funds complying with Islamic principles, in over 51 countries (Solé, 2007). During the period 1997 to 2007, the Islamic banking industry reached an annual total asset growth rate of 23%. In 2007 total assets exceeded USD175 billion, compared to around USD20 billion ten years previously, in 1997. In 2007 Islamic banks employed around 300,000 people (Ibrahim, 2007). Meanwhile, the total assets of the Islamic banking industry experienced a compound annual growth rate of 40.3% between 2004 and 2011, and reached USD1.1 trillion (Islamic Financial Services Board, 2013). At the end of 2012, the total assets of the Islamic financial services industry were estimated to have reached USD1.6 trillion, representing a 20.4% year-on-year growth since the end of 2011 (Islamic Financial Services Board, 2013). These facts show the significant change in the status of Islamic banks in the banking industry. Given that the Muslim population increased to almost 2 billion - just under 30% of the total world population in 2011 (www.muslimpopulation.com, 2012), it is understandable to expect that Islamic banking should constitute a substantial proportion of the global banking system.

Islamic financial institutions started to emerge In Indonesia in the early 1980s with the establishment of *Baitut Tamwil, a* Division of Koperasi Jasa Keahlian Teknosa in Bandung (1984) and Koperasi Ridho Gusti in Jakarta (1988) (Aliludin, 1990). The first full Islamic Bank in Indonesia, Bank Muamalat Indonesia, was established in 1992. From this beginning Indonesia has developed a dual banking system, first introduced in 1998, in which Islamic and non-Islamic banks operate side by side. It is graphically depicted in Figure 1.1.

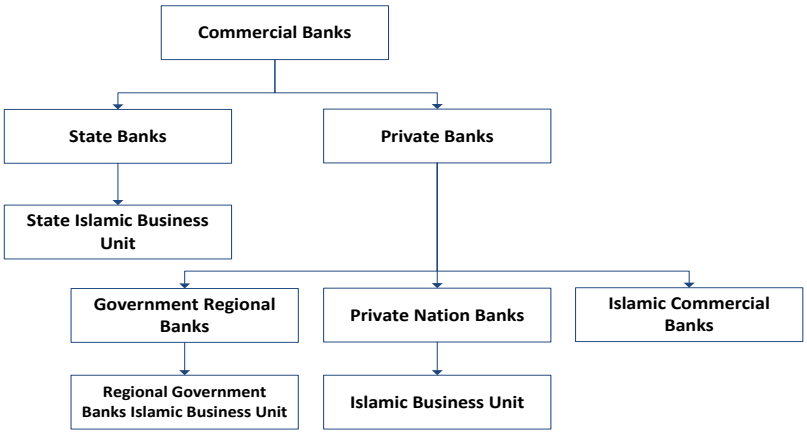

Figure 1-1 Indonesian commercial banking structure

Source: www.bi.go.id, 2012

Islamic banking consists of Islamic commercial banks and Islamic Business Units (IBUs). IBUs are Islamic divisions of non-Islamic institutions offering Islamic banking products and services. These units have their own infrastructure, including staff and branches, which are separate from their parent banks (Ascarya & Yumanita, 2005).

At the time this research was conducted, the Islamic banking industry in Indonesia was expected to have a significant role in supporting the national economy. According to Bank Indonesia (2012), the development of Islamic banking is aligned with other strategic plans such as Indonesian Banking Architecture, Indonesian Financial System Architecture, and both medium and long-term National Development Plans. Under the dual banking system, Islamic and non-Islamic banks synergise to mobilise public funds to foster the financing of the national economic sector. This role of Indonesian Islamic banking shows that it has a larger social mission, instead of being business as usual. The partnership principle of Islamic banking provides mutual benefit for both the public and the bank (Bank Indonesia, 2012), as is encoded in their vision and mission statements, which will be discussed in Section 3.4.

As in the rest of the world, Islamic banking in Indonesia has been growing relatively faster than non-Islamic banking. Over the period 2001 to 2010, the average total asset growth of the Indonesian Islamic banking industry exceeded 50% per annum. This figure was much higher than the average growth of the non-Islamic banks,

which experienced total asset growth of around 13% per annum over the same period. The higher Islamic banking growth rate is depicted in Figure 1.2. The logarithmic scale better depicts growth rates given the huge differences in market share of Islamic and non-Islamic banks. In 2002 the Islamic share was 0.36%. This increased to 3.24% in 2010 amidst the average 50% growth of total assets per annum.

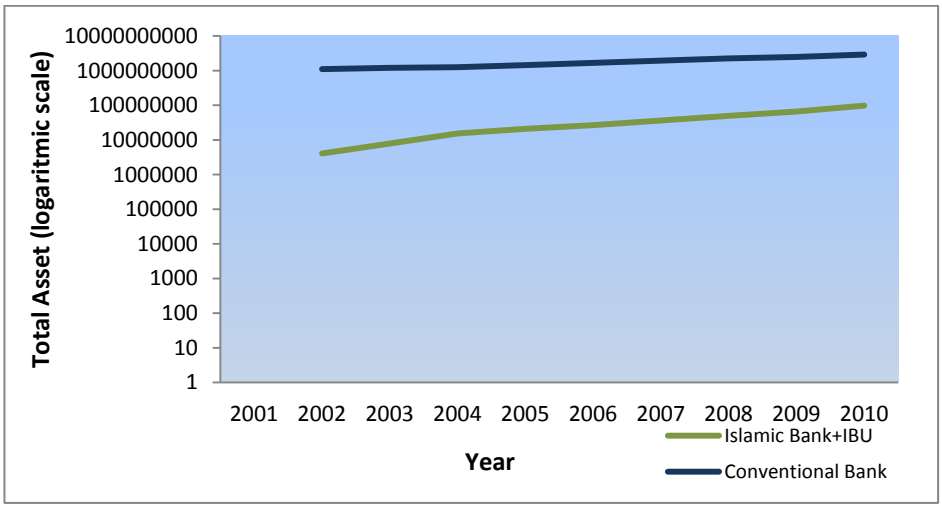

Figure 1-2 Total asset growth of Indonesian Islamic and non-Islamic banks 2002–2010 (Logarithmic Scale)

Source: Indonesian Banking Statistics and Islamic Banking Statistics of Bank Indonesia, 2002–2010

Despite their impressive growth, Islamic banks have achieved less that was predicted by Bank Indonesia and Karim Business Consulting (2004). The predictions and the actual Indonesian Islamic banking market share for the period 2005 to 2011 are reflected in Figure 1.3. Of the four curves in the graph, the first and second represent the optimistic (KBC High) and pessimistic (KBC Low) predicted growth assumptions of Karim Business Consulting. The third represents the Islamic bank market share growth prediction made by Bank Indonesia (BI). The last curve represents the actual market share growth of Indonesian Islamic banks. It is evident that the real market share growth of Islamic banks in Indonesia is lower than was predicted.

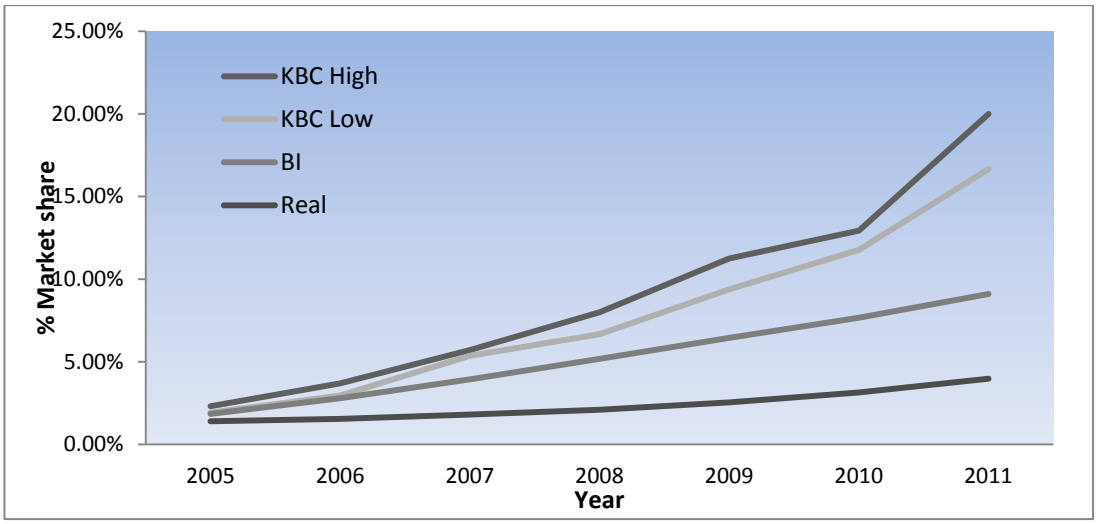

Figure 1-3 Predicted and actual market share of Islamic banks in Indonesia

Source: Karim (2004) and Islamic Banking Statistics of Bank Indonesia from 2005 to 2011

Clearly, while Islamic banking in Indonesia has been growing relatively faster than the non-Islamic banking, it has not achieved the market share that was expected.

1.2 Problem statement

It is evident from the information in the preceding section that the global growth of Islamic banking is extensive and that the Central Bank of Indonesia expects it to also grow in Indonesia due to a local Muslim population of 87%. However, the Indonesian Islamic Banking growth is substantially slower than expected. The reasons for this situation have not been determined or researched. This research seeks to comprehend why Islamic banks have not grown as predicted. We begin the analysis by considering whether there are more issues than being Islamic or non-Islamic that differentiate the two 'sides' of Indonesian banking. Is the difference one of name, or philosophy; or does it encapsulate a range of business practices? The research therefore begins by considering the efficiency which is implied in the needs of the banks' range of stakeholders (see Section 3.4). We then consider if differing efficiencies along these areas, or dimensions, are related to the growth of Islamic banks.

1.3 Objectives of the study

The objectives of this research are to:

a. determine whether Indonesian Islamic banks differ from non-Islamic banks in terms of efficiency with regard to the different stakeholders that banks serve;
b. analyse the impact of the efficiency differences on the total asset growth of Indonesian Islamic banks; and
c. determine the variables that significantly affect the growth of Indonesian Islamic banks.

1.4 Scope of the study and research methodology

The study entails a literature review and empirical research based on the objectives stated above. The literature review addresses the global growth of Islamic banking, the growth of Islamic banking in Indonesia, differences in the financial data of Islamic and non-Islamic banks, previous research about the efficiency of Islamic banks, and research where the efficiency of Islamic and non-Islamic banks has been compared.

The empirical research is based on financial information (balance sheets and income statements) and non-financial information (number of branches and number of employees) of all Islamic and non-Islamic banks in Indonesia from 2003 to 2010. The combination of financial and non-financial information constitutes the grouping of variables to determine the efficiency of banks in serving their stakeholders. Data Envelopment Analysis (DEA) is applied to determine the stakeholder efficiency of all banks and to compare Islamic and non-Islamic banks with each other. In addition, regression analysis is applied to determine the significance of the different components of stakeholder efficiency with regard to the growth of Islamic banking in Indonesia.

1.5 Presentation of the research

This thesis consists of five chapters. A literature review is conducted in Chapter 2. Chapter 3 consists of the empirical research methodology applied in this study. The findings of the comparative efficiency of Islamic and non-Islamic banks in Indonesia

are provided in Chapter 4. The fifth and final chapter concludes the research and provides recommendations.

Chapter 2
LITERATURE REVIEW

2.1 Introduction

Literature relevant to the objectives of this research is addressed in this chapter. Firstly, the global growth of Islamic banks is discussed, then the growth of Islamic banking in Indonesia is reviewed. It is evident that Islamic banking is growing rapidly around the world, including in Indonesia. However, its growth is below the expectations of Bank Indonesia (the Indonesian Central bank) and other researchers.

This dissertation presents a comparative efficiency analysis of Islamic and non-Islamic banks in Indonesia to determine possible reasons for the difference between expected and actual growth. To ensure that the comparison, based on relevant financial data Islamic banks, is rigorous, this study reviews literature that highlights the differences in the financial reporting of Islamic and non-Islamic banks. It is evident from the literature that there are differences between the balance sheets and income statements of these two types of bank, amionly the result of operational differences. However, certain adjustments applied to implicated financial figures can resolve the issue of making the financial statements comparable.

Previous research about the efficiency of Islamic banking and the comparative efficiency of Islamic and non-Islamic banking are also reviewed. It is evident that DEA is one of the most prominent tools to measure the relative efficiency of Islamic banks. Finally, a summary of the chapter highlights how this dissertation contributes to the literature based on a comparison between the objectives of this study and of previous research conducted.

2.2 The growth of Islamic banking in the world

Islam is not only a religion with rituals, but a complete way of life adhered to by Muslims. In general, Islamic values consist of a*qidah* (theology), s*haria* (laws and rules), and *akhlak* (ethics). The *sharia* consist of *muamalah* (social aspects) and

ubudiah (ritual aspects). The *muamalah* or social aspects of Islam apply to all interactions between human beings, including economic activities**.**

All applications of Islam in principle are derived from the Holy Book of Revelation (the *Quran*) and the traditions of the Holy Prophet Muhammad (the *Hadith*). As a consequence, every Muslim's activities (including economic activities) must comply with the *Quran* and the *Hadith.* Forbidden in Islamic theology is *riba*. *Riba* is defined as any payment over and above the actual loan amount (Ariff, 1988). *Riba* is clearly forbidden in both the *Quran* and the *Hadith*. Antonio (2001) mentions that the prohibition of *riba* was revealed in the *Quran* in four stages. The final revelation (and the toughest prohibition) regarding *riba* is stated in the *Quran, surah* (chapter) *Al-Baqara, ayah* (verse) 278–279:

يَا أَيُّهَا الَّذِينَ آمَنُوا اتَّقُوا اللَّهَ وَذَرُوا مَا بَقِيَ مِنَ الرِّبَا إِن كُنتُم مُّؤْمِنِينَ

فَإِن لَّمْ تَفْعَلُوا فَأْذَنُوا بِحَرْبٍ مِّنَ اللَّهِ وَرَسُولِهِ وَإِن تُبْتُمْ فَلَكُمْ رُءُوسُ أَمْوَالِكُمْ لَا تَظْلِمُونَ وَلَا تُظْلَمُونَ

> O ye who believe! Fear Allah, and give up what remains of your demand for usury, if ye are indeed believers. If ye do it not, take notice of war from Allah and His Messenger: But if ye turn back, ye shall have your capital sums: deal not unjustly, and ye shall not be dealt with unjustly. (*Al-Baqara* 278–279; translated by Ali 2000)

In this translation, *riba* (الربا) is presented as usury. Most Islamic scholars consider the interest which is applied in the banking system to be *riba*, although other scholars believe that interest is different, *and* so is permissible (Aliludin, 1990). These different opinions have resulted in different *fatwa* (rulings or verdicts) about non-Islamic banking. The scholars who regard interest to be different from *riba,* have no objection to non-Islamic banking. But the majority of Islamic scholars whose understanding is that interest is *riba* forbid non-Islamic banking transactions.

To cater for the needs of those requiring banking services in compliance with their religious duty, a banking system that complied with Islamic principles was established, replacing interest with profit–loss sharing and mark-up schemes. Mit Ghamr Savings bank in Egypt, established in 1963, is regarded as the first experiment applying Islamic principles in banking. The Mit Ghamr was founded by

Ahmed El Najjar, who established a number of savings and investment houses (or branches) in several small towns in rural areas of northern Egypt. The name Mit Ghamr was derived from the name of the small town where the first of these houses was established (Kahf, 2004; Warde, 2000). This bank combined the German savings[1] bank concept with Islamic principles (Lewis & Algaoud, 2001). Najjar was introduced to the German model during graduate studies in Germany. The local savings banks were organised as small units that operated within specific geographical areas (Hegazy, 2007). The Mit Ghamr similarly operated as several small units in different geographical areas, and focused on the generation of savings to provide development funding for small farmers (Kahf, 2004). The bank proved popular (Lewis & Algaoud, 2001): its customers increased more than thirteen times in three years, from 17,560 people in 1963–1964 to 251,152 in 1966–1967. In the same period, its deposits grew more than 43 times, from £E40,944 to £E1,828,375 (Karim, 2004).

Lewis and Algaoud (2001) speculate that Mit Ghamr Bank was formed without showing an Islamic 'label' or identity, to prevent it from being seen as a manifestation of Islamic fundamentalism by the ruling regime. Kahf (2004) and Visser (2009) agree, but note that there was a suspicion that the Mit Ghamr related to the Muslim Brotherhood (*Ikhwan ul-Muslimin*), an organisation that was (and is) associated with Islamic fundamentalism. Lewis and Algaoud's view is supported by the fact that the Mit Ghamr Bank was closed in 1967 and taken over by the National Bank of Egypt. After it was taken over, the bank's profit–loss sharing principle did not continue and it operated as a non-Islamic bank (Lewis & Algaoud, 2001).

The political situation in Egypt changed in 1970 after the death of the president of Egypt, Gamal Abdel Nasser, on September 28. After that time, banks could openly label themselves as Islamic (Visser, 2009). The new president, Anwar Sadat, established the Nasser Social Bank in 1971. This bank operated as a social lending agency, acting as an interest-free commercial bank without a specific reference to Islam in its charter (Lewis & Algaoud, 2001).

[1] The German banking concept is a model of universal banking which permits the combination of commercial and investment banks (Karim, 2001).

Prior to the emergence of the Nasser Social Bank, the government of Egypt proposed the establishment of an Islamic bank at the Foreign Ministers' Conference of the Organisation of Islamic Conference (OIC) in Pakistan, in December 1970. They proposed that a study of international Islamic banks for trade and development, and the establishment of a federation of Islamic banks, be conducted. In addition, they proposed the formiation of an investment and development body of Islamic countries, and of special representatives for the proposed association of Islamic banks (Antonio, 2001).

According to Kahf (2004), the national earnings of the oil-exporting Middle East countries were rising as a result of the dramatic increase in oil prices after the October 1973 war and the beginning of Arab oil embargo. These events triggered the idea of establishing an international development bank for the Islamic world; and in 1975 the OIC Finance Ministers' Conference in Jeddah approved the establishment of the Islamic Development Bank (IDB). There were for two main reasons for this move:

a. it would enhance the role of the OIC as a potential power base for the newly wealthy countries, especially Saudi Arabia and Algeria;
b. it would serve as a buffer institution to provide financial assistance from Muslim oil-exporting countries, especially the Gulf states, to their brethren in Africa and Asia.

There were 22 member countries at first (Antonio, 2001)**;** by 2010 there were 56 (Islamic Development Bank, 2010). After the establishment of the IDB, Islamic banking showed quick growth in many countries; banks that were established included the Dubai Islamic Bank (1975), the Faisal Islamic Bank, in Egypt and Sudan (1977), and the Kuwait Finance House in Kuwait (1977) (Ascarya et al., 2010).

Nowadays, they exist not only in countries whose populations are predominantly Muslim, but in countries where Muslims form a minority. In 2007 there were more than 300 Islamic financial institutions and over 250 mutual funds complying with Islamic principles, in over 51 countries (Solé, 2007). In the period 1997 to 2007, the Islamic banking industry reached an annual total asset growth rate of 23%. In 2007

total assets exceeded USD175 billion, compared to around USD20 billion ten years previously, in 1997. In 2007 Islamic banks employed around 300,000 people (Ibrahim, 2007). Meanwhile, the total assets of the Islamic banking industry experienced a compound annual growth rate of 40.3% between 2004 and 2011, and reached USD1.1 trillion. At the end of 2012, the total assets of the Islamic financial services industry were estimated to have reached USD1.6 trillion, representing a 20.4% year-on-year growth since the end of 2011 (Islamic Financial Services Board, 2013). These facts show the significant change in the status of Islamic banks in the banking industry. Given that there are almost 1.977 billion Muslims in the world, representing just 28.73% of the total world population in 2011 (www.muslimpopulation.com, 2012), it is understandable to expect that Islamic banking should constitute a substantial proportion of the global banking system.

2.3 The growth of Islamic banking in Indonesia

In Indonesia, discussions about Islamic banking concepts started before World War II and the independence of the Republic of Indonesia, in 1945. Back then, much debate focused on whether bank interest is the same as *riba*. Islamic scholars and leaders stated their arguments publicly in newspapers. Dr Mohammad Hatta, the first vice president of Indonesia and a respected economist, argued that bank interest is not the same as *riba.* In his opinion, it was permissible to apply interest in the banking sector (Rahardjo, 1988). Rahardjo argues that Hatta's thoughts had an important influence on the development of the Indonesian banking system, and that his opinion about interest and *riba* might explain the delayed development of Islamic banking in Indonesia compared with other Muslim countries.

Indonesian Islamic banking initiatives started in the early 1980s with the establishment of *Baitut Tamwil* Division of Koperasi Jasa Keahlian Teknosa in Bandung in 1984, and Koperasi Ridho Gusti in Jakarta in 1988 (Aliludin, 1990). Both were cooperative institutions with limited operations that can be considered prototypes of Islamic banking in Indonesia. Ascarya and Yumanita (2005) state that in 1992, the Indonesian government implemented Act no 7/ 1992, allowing banks to conduct business on the profit and loss sharing principle. This act enabled the establishment of banks with Islamic (*sharia)* principles in Indonesia, and within the

year, Bank Muamalat Indonesia was became the first Islamic bank to implement *sharia*-compliant principles.

According to Ascarya and Yumanita (2005), in the late 1990s, Bank Indonesia allowed non-Islamic banks to establish Islamic branches, following the Banking Act of 1998 and the new Central Bank Act of 1999. In Indonesia, the Islamic branches of non-Islamic banks, or IBUs, offer Islamic banking products and services and have their own infrastructure, including staff and premises, which separate them from their parent banks. Under these conditions, the growth of the Islamic banking industry accelerated. Under the Central Bank Act of 1999, Bank Indonesia became the regulator and supervisor of both non-Islamic and Islamic banks. This was the start of the official dual banking system practice.

In Indonesia, Islamic banking and its non-Islamic counterpart are viewed as important to the national economic development of the country. According to Bank Indonesia (2012), the development of Islamic banking is aligned with other strategic plans such as Indonesian Banking Architecture, Indonesian Financial System Architecture, as well as the Medium and the Long-Term National Development Plan. Furthermore, under the dual banking system, Islamic and non-Islamic banks synergise to mobilise public funds to foster the financing of the national economic sector.

Indonesia has a very large Muslim population. The 2010 census conducted by the Indonesian Central Bureau of Statistics reported 207,176,162 Muslims living in Indonesia, representing 87% of the total population (*Biro Pusat Statistik*, 2012). It is therefore not surprising that Indonesian Islamic banks grow at a higher rate than non-Islamic banks because of the large Muslim population. This higher growth rate is depicted in Figure 1.2. This figure shows the total asset growth of Indonesian Islamic and non-Islamic banks over the period 2002–2010 with a logarithmic scale applies to its y-axis to cope with the very large difference between the total assets of the Islamic and non-Islamic institutions.

To reiterate the observations made earlier, the growth of Islamic banks in Indonesia, as shown in Figure 1.2, is much higher than the growth of their non-Islamic counterparts. However, the growth level of the Islamic banks is still below the

prediction of Bank Indonesia and Karim Business Consulting (Karim, 2004). Figure 1.3 provides a comparison between the aforesaid predicted market share and the actual market share[2] of Indonesian Islamic banks over the period 2005–2011. There are four curve lines in the graph. The highest and second-highest curves represent the optimistic (KBC High) and pessimistic (KBC Low) predicted growth assumptions of Karim Business Consulting. The third one represents the Islamic bank market share growth prediction made by Bank Indonesia (BI). The lowest curve represents the real market share growth of Indonesian Islamic banks. These curves show that the real market share growth of Islamic banks in Indonesia is lower than what was predicted.

Islamic banking in Indonesia has been growing relatively faster than the non-Islamic banking. However, the growth in market share of Islamic banking is still below expectations.

2.4 Comparing financial report information of Islamic and non-Islamic banks

The financial reporting standards for non-Islamic banks in Indonesia are based on the International Financial Reporting Standards (IFRS), but Islamic banks and financial institutions in Indonesia comply to the standards set by Accounting and Auditing of Islamic Financial Institutions (AAOIFI). AAOIFI is a Bahrain-based non-profit organisation, established in 1991 (Ibrahim, 2007).

Ibrahim (2007) argue that the financial reports of Islamic banks and financial institutions should be harmonised, although not standardised, with the globally accepted International Financial Reporting Standards (IFRS). They do not support standardisation because the financial reports of Islamic banks and financial institutions cannot fully comply with the IFRS due to the compliance to the Islamic laws. This compliance results in different balance sheet and income statement accounting formats.

Karim (2001) states that Islamic banks apply the universal banking model in a different context since interest charges and payments do not exist. The universal

[2]Measured by the percentage of Indonesian Islamic bank total assets to the total assets of Indonesian banking industry

banking permits the combination of commercial and investment banks. Apart from the interest rate issue, Islamic banks perform both investment and commercial banking operations. Traditional universal banking deals differently with shareholder funds and the external finance that they obtain from deposits and other borrowings. External finance providers are reimbursed at an agreed interest rate return, and any profits or losses are borne by the shareholders. In contrast, Islamic banks generally combine external finance (normally in the form of deposits) with shareholder funds and regard it as a combined group of funds that are invested in the same portfolio (e.g. loans) and that therefore bear the same risk. Profits and losses are shared equally between the external finance providers and the actual shareholders, even though the external finance providers are not shareholders. However, other arrangements with external finance providers also exist; for instance there are schemes whereby they can bear losses made by the investment of their money, or their investment capital can be guaranteed, as is explained below.

To mobilise investment account funding, Islamic banks apply a profit–loss sharing contract (*mudaraba*) in place of mainstream borrowing and interest payment practices. According to Beck, Demirgüç-Kunt, and Merrouche (2013), under *mudaraba* the investor provides the funds while the borrower provides the effort and skill to make it profitable. Profit generated by the borrower's efforts is shared at a predetermined ratio between both parties. Any losses are borne exclusively by the investor. In this way all investment deposit accounts are fully involved in the profit–loss and risk sharing arrangements of Islamic banks.

In addition to the *mudaraba* contract, Islamic banks offer the *musharaka* contract. According to Beck et al. (2013), the *musharaka* contract considers the bank as one of the investors. Profits and losses are shared among all investors. The *musharaka* contract appears on the deposit side of an Islamic bank balance sheet, with investment accounts or deposits that do not attract a fixed (predetermined) return but are subject to profit–loss sharing. The investment deposits are sometimes linked to a bank's overall profit, and in other cases to a specific investment account on the asset side of a bank's balance sheet.

Beck et al. (2013) mention other categories on the deposit side of an Islamic bank: non-remunerated demand deposits (*wadiah* or *amanah*), saving deposits, and

investment deposits. Like demand deposits in non-Islamic banks, demand deposits in Islamic banks can be seen as depositors' loans to the bank. Saving deposits in Islamic banks do not carry an interest rate but participate in the profits of the bank; however, banks may pay regular bonuses to demand and saving deposits accounts.

Ijara and *murabaha* contracts are major forms of finance (Beck et al., 2013). The *ijara* contract is similar to an operating lease, since the bank keeps ownership of the asset and rents it to the client for a certain fee. The *murabaha* contract involves the purchase of goods. In this contract, the bank buys an asset and then sells it to the client, with instalment payments and a profit margin in the form of a fee. The *murabaha* contract is mostly applied in consumer finance for the financing of assets such as vehicles and houses (like residential mortgages in the case of non-Islamic banks). However, there are significant differences in the financing methodology. According to Ikatan Akuntan Indonesia (2003), the asset (e.g. house) appears in the bank's balance sheet as the outstanding loan amount that includes the mark-up margin that replaces the interest rate charge. In the case of non-Islamic banks only the outstanding loan amount appears in the balance sheet. Furthermore, the installment on the Islamic bank loan is based on the equal proportional repayment of the fixed margin over the total term of the loan repayment. In the case of non-Islamic banks the interest portion of repayment instalments reduces over the term of repayment in accordance with the capital outstanding on the loan. Usually the portion of interest is much bigger at the beginning, and decreases over the loan period. Profit generation comparisons between mark-up margins by Islamic banks and interest rate spreads by non-Islamic banks are implicated by this issue.

Indonesian Islamic banks have their own accounting standard, *Pedoman Akuntansi Perbankan Syariah Indonesia* or the Accounting Guidelines for Indonesian Islamic Banking (Ikatan Akuntan Indonesia, 2003). The standards comply with the standards of AAOIFI. Considering the differences in the financial reports of Islamic and non-Islamic banks and the AAOIFI, it is necessary to map the financial report formats for both types of bank and to do adjustments to figures in order to compare their financial data. This procedure, and the limitations experienced in aligning data accurately for comparative purposes, is discussed in Section 3.8.

2.5 Previous research about Islamic banking efficiency

Adjustments are needed to compare the financial reports of Islamic and non-Islamic banks. Efficiency measurement and comparisons can only be conducted based on comparable financial reports. This section will discuss previous research about Islamic banking efficiency, as a basis to compare the efficiency of Islamic and non-Islamic banks.

Yudistira (2003)[3] studied 18 Islamic banks across 12 countries, including Indonesia, over the period 1997–2000. He utilised non-parametric DEA with an intermediation[4] approach to measure technical (see Section 3.9) and scale efficiency[5]. Yudistira argues that the intermediation approach is the most appropriate method to evaluate Islamic banking efficiency because it is in line with the Islamic financial principle which is focused on the intermediary function: namely, to focus on channelling deposits to financing activities. Yudistira defines three outputs (total loans, other income and liquid assets) and three inputs (staff cost, fixed assets and total deposits) by which to measure efficiency. He finds that the Islamic banks in the sample suffered from the economic crisis of 1998–1999, indicated by decreasing average efficiency scores over that time followed, by an increase in average efficiency thereafter.

Yudistira (2003) compared the changes in efficiency based on separate annual DEA frontiers. Applying a single multiyear-frontier DEA or the Malmquist Productivity Index[6] might have been more appropriate because DEA scores are awarded only in relation to the most efficient ones in the applicable year of comparison. Separate year average efficiencies do therefore not provide good year-to-year comparisons.

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[3] This is the first study to appliy DEA to measure Islamic banking efficiency (Bader et al., 2008)

[4] The intermediation approach was suggested by Sealey and Lindley (1977). According to Favero and Papi (1995), intermediation approach is a technique that considers banks as intermediary institutions of financial resources between surplus and deficit units.

[5] Scale efficiency is the relationship between per unit average production cost and volume (Yudistira, 2003).

[6] Malmquist Productivity Index (MPI) is one of the DEA methods that can be apply to calculate indices of Total Factor Productivity changes, technological changes, technical efficiency changes, and scale efficiency changes. This method can only be applied to balanced panel data (Coelli, 1996)

Al-Delaimi and Al-Ani (2006) measured cost efficiency[7] of 24 Islamic banks around the world over the period 1999–2001. They applied a CRS DEA model with three inputs and two outputs. The input variables were capital (assets – (liabilities + capital reserves)), capital reserves (profits ready to distribute but not yet distributed), and deposits (of current, saving, and investment). The outputs used were investment and total assets. They found that most Islamic banks in the sample were efficient, and the rest were improving their cost efficiencies. They conducted year-by-year efficiency measurements every two years (i.e. 1999–2000 and 2000–2001) to observe changes in efficiency. A more comprehensive measurement conducted on a multi-year basis for the total study period (1999–2001) might have provided more appropriate findings.

Sufian (2006, 2007) examined the efficiency of 17 Malaysian Islamic banks (consists of 13 domestic and 4 foreign banks) over the period 2001–2005, applying DEA with a combined production[8] and intermediation approach. The input variables used were total deposits and non-performing loans, and the output variables were total loans and investments. He found that that the technical efficiency of the banks was highest in 2001 and declined in 2002, then gradually increased in 2003 and 2004. He also found that the Malaysian Islamic banks had low scale efficiency, and that foreign banks were less efficient than the domestic ones. Sufian, like Yudistira (2003) and Al-Delaimi and Al-Ani (2006), did not consider the argument of Canhoto and Dermine (2003) that DEA efficiency is a relative measurement, confined to the sample set. Comparing the efficiency scores based on different frontiers (due to separate year DEA measurements) would have improved the validity of the findings.

Yaumidin (2007) investigated the efficiency of 48 Islamic banks in the Middle East and South East Asia, including Indonesia, over the period 2000–2004, applying DEA with an intermediation approach. For the analysis three inputs (overhead expenses, fixed assets, and total deposits) and three outputs (total loans, other operating income, and total earning assets) were used. She found that the Islamic banks in

[7] Cost efficiency can be achieved if a bank uses a combination of inputs to produce a desired level of outputs at a minimum cost (Al-Delaimi & Al-Ani, 2006)

[8] Production approach views banks as producers of loans and deposits (Favero & Papi, 1995)

South East Asia were slightly better in terms of overall efficiency than those in the Middle East during the study period. The author also found that the efficiency of the Middle East Islamic banks were decreasing during 2001 and 2002. She argues that the efficiency were decreasing because of the 9/11 2001 attack in the USA, and the 2002 war in Iraq. The MPI was conducted to observe the efficiency changes of six South East Asian Islamic banks and 16 Middle Eastern Islamic banks over the period 2000–2003. In general, technical efficiency was found to have declined during 2000–2003.

Kamaruddin, Safa, and Mohd (2008) assessed the efficiency of two Islamic banks and twelve Islamic windows[9] in Malaysia from 1998–2004. This research used DEA to evaluate the cost and profit efficiency of the banks. The input variables to measure cost and profit efficiencies were the same: labour, deposits, and physical capital. The input prices were price of labour, price of deposits, and price of physical capital.[10] Outputs for cost efficiency were earning assets, liquid assets, and other income; and outputs for profit efficiency were profit before taxation and *zakat* (charity). Their findings were that Islamic banks were relatively more efficient with the control of costs than with the generation of profits.

Sufian, Noor, and Majid (2008) investigated the efficiency of 37 Islamic banks in the Middle East and North Africa (MENA) and Asian countries during the period 2001–2006, using the DEA with an asset approach, two inputs, and three outputs. The input variables were total deposits (including deposits from customers and other banks) and assets; the outputs were total loans (including loans to customers and other banks), income (including income derived from investment of depositors' funds and from other banking operations), and investment (including investment securities held for trading, available for sale, and held to maturity). The study found that Islamic banks in the MENA region had higher average technical efficiency than Asian Islamic banks. For both regions, technical inefficiency was mostly affected by pure

[9] Islamic windows are non-Islamic banks that offer Islamic banking services (similar to an Islamic banking unit in Indonesia).

[10] In addition to input and output variables, price data for each variable is used to calculate cost, revenue, and profit efficiency. For further reading see Coelli 1996, p.25.

technical inefficiency rather than scale inefficiency. The technical inefficiency was measured by Constant Returns to Scale or CRS, while the pure technical inefficiency was measured by Variable Returns to Scale or VRS (cross ref to Section 3.9). Thus, the technical inefficiency was due to the managerial inefficiency of the Islamic banks rather than size inefficiency.

Sufian and Noor (2009) studied the efficiency of 37 Islamic banks in 16 countries in the MENA region and Asia (including Indonesia) over the period 2001–2006. In the first stage they applied DEA using two inputs: total deposits (deposits from customers and other banks) and physical capital. Their three outputs were total loans (loans to customers and other banks), income (derived from investment of depositors' funds and from other banking operations), and investments (held for trading, available for sale, and held to maturity). In the second stage, Tobit regression was applied to determine the impact of internal and external factors on efficiency.[11] The MENA banks showed a higher DEA technical efficiency (CRS) mean than their Asian counterparts. Pure technical inefficiency (VRS) outweighed scale inefficiency in both the MENA and Asian banking sectors for all study periods except 2006; this indicates that the banks had been operating at a relatively optimal scale. However, they were managerially inefficient in optimising their resources. The banks from the MENA region were found to dominate the efficiency frontiers over the period of the study.

For all banks in the survey, a positive relationship was found between efficiency and loan intensity, size, capitalisation, and profitability. The empirical results show that technically more efficient banks had smaller market shares and lower non-performing loan ratios. Their analysis, based on the use of a Tobit model, confirms these findings.

Ascarya et al. (2010) measured the efficiency of Islamic banks in Indonesia and Malaysia using a Stochastic Frontier Approach (SFA), a Distribution Free Approach

[11] The Tobit model is a regression model suggested by Tobin in 1958. The model is appropriate in cases where the dependent variable value lies between two limits, e.g. between 0 and 1 (Shah, Shah & Ahmad, 2012).

(DFA)[12] and a DEA approach over the period 2002–2006. They used total deposits, labour and fixed assets as inputs, and total loans and total income as outputs. The application of the parametric SFA showed that during 2002–2004, Malaysian Islamic banks were more efficient than their Indonesian counterparts; however, in 2005 Indonesian Islamic banks were more efficient, and in 2006 the efficiency scores of both countries' banks were the same. The application of DFA revealed that the average efficiency scores of the Indonesian banks were higher than those of the Malaysian banks during the total study period (2002–2006). The non-parametric DEA showed that Islamic banks in Indonesia were slightly more efficient than Islamic banks in Malaysia because of better technical efficiency, although funding (deposits) and human resource issues (labour) were major areas of inefficiency in both countries.

The study by Ahmad, Noor and Sufian (2010) covered 77 banks in 25 countries, including Bank Muamalat Indonesia, over the period 2003–2009. Using DEA and applying the intermediation approach, this research incorporated total loans, income (derived from investment of depositors' funds and other banking operations) and other earning assets as input variables, while total deposits, labour cost, and total assets were the output variables. They found that for the time under study, banks from high income countries dominated the efficiency frontier. They also found that the pure technical efficiency (VRS efficiency) of banks was higher than their scale efficiency.

Moussawi and Obeid (2010) evaluated productive efficiency (technical, allocative, and cost efficiency) of 23 Islamic banks in the Gulf Cooperation Council (GCC) countries during 2005–2008. DEA with a production approach was applied in this research. The approach incorporated three inputs (total deposits, total fixed assets, and labour cost), and two outputs (total earning assets and net commission). The findings indicate that the production efficiency of the banks in the sample increased during the study period; however, there were efficiency gaps between the most

[12] SFA and DFA are parametric approaches that are used to measure efficiency. Unlike in non-parametric approaches, a more structured functional form has to be defined. The more structured functional form allows for accommodating random error, so is less likely to miss identifying measurement errors, transitory differences in cost, or errors as inefficiency (Bauer et al., 1998).

efficient and the least efficient banks of up to 75%. Their investigation into efficiency differences indicated that inflation was a significant contributory variable.

Ahmad and Noor (2011) investigated the efficiency of 78 Islamic banks in 25 countries over the period 1992–2009 (464 observations), applying a combination of intermediation and asset approaches in their DEA.[13] Tobit regression was also applied in this research. Their three inputs were total deposits, labour cost, and total assets, and their three outputs were total loans, income, and other earning assets. Return on Equity (ROE) was used to measure the profitability of the banks. All variables (expressed in millions of US Dollars (US$)) were deflated based on the inflation rates of the different countries. The research findings showed that:

- The efficiency of Islamic banks increased in 2003 and 2004, decreased from 2005 to 2007 and increased again in 2008 and 2009.
- The average efficiency of the banks improved during the global financial crisis – from 50% in 2007 to 65% in 2008 and 95% in 2009; the Islamic banking industry was better prepared for the crisis than other banks, and a migration of consumers from non-Islamic to Islamic banks took place.
- There is a positive correlation between the profitability and technical efficiency of banks, with strong correlation in Asia; and
- A positive and statistically significant relationship exists between profitability and operating expenses/ total assets, equity, high-income countries, and non-performing loans/ total loans.

Mostafa (2011) compared the efficiency of 87 Islamic banks (including Bank Muamalat Indonesia) in 2009.[14] The author used VRS DEA with an intermediation approach. The inputs were total assets and equity; the outputs were net income, return on assets (ROA), and return on equity (ROE). This study found that the average efficiency of the banks under investigation was 45.98% with a standard

[13] Asset approach is an advanced form of intermediation approach, in which the outputs are strictly defined by assets and by the production of loans (Favero & Papi, 1995).

[14] The data was obtained from the annual list of top 100 Islamic banks, published by the Asian Banker magazine. The dataset consisted of banks with available financial information and no negative financial data.

deviation of 31.61. The efficiency scores ranged from 1.42% to 100%. Bank Muamalat Indonesia, the only Indonesian bank in the sample, had a VRS score of 61.14%.

Pramuka (2011) investigated the profit efficiency of Islamic commercial banks and IBUs in Indonesia over the period 2003–2009. The Stochastic Frontier Approach (SFA) was used with two different models. Three inputs were used: total deposit (third party funds and deposits from other banks), total overhead expenses (personnel and other operating expenses), and physical capital. The output variables were profit before taxation and financing volume. The input and output variables were applied in an intermediation approach. Comparison of the DEA findings resulting from the different combinations showed that financing volume significantly contributed to profit before taxation. Based on this finding, the author argues that Islamic banks should focus on channelling their funds to the real sector instead of investing in the monetary market. The findings also indicate that the commercial banks were more efficient in generating profit than the business units.

Tahir, Bakar, and Haron (2011) researched the efficiency of Islamic banks in Africa, Europe, the Far East, Central Asia, and the Middle East over the period 2003–2008. The authors applied a DEA intermediation approach with two inputs (total deposits and overhead expenses) and two outputs (total loans and other earning assets), and found that the average technical efficiency (CRS) of the banks in the sample declined from 74.6% in 2003 to 54.4% in 2008. Furthermore, pure technical efficiency (VRS) had a large effect on the overall technical inefficiency (CRS) of the banks under investigation. This implied that Islamic banks were comparatively more inefficient in controlling their resources than in conducting business at an appropriate scale. As this study measured DEA efficiency separately on an annual basis, the year-to-year efficiency cannot be compared.

The authors also compared the efficiency of Islamic banks based on region of operation and size. Parametric (ANOVA and *t*-test) and non-parametric tests (Kolmogorov–Smirnov and Mann–Whitney) were applied at a 5% level. The authors found no statistically significant differences in the efficiency of Islamic banks operating in the Middle East and those outside that area. On the other hand, the authors did find statistically significant differences between the efficiency of large

Islamic banks with total assets of more than $600 million and the small and medium banks with assets below this figure.

Noor and Ahmad (2012) conducted another study of the same Islamic banks in the 25 countries, including Bank Muamalat Indonesia, during 1992–2009, following the same procedure as their earlier research in 2011. They applied DEA with a combination of intermediation and asset approaches and Tobit regression analysis. Input variables for the DEA were total deposits (from customers and other banks), labour cost, and total assets. The output variables were total loans (loans to customers and to other banks), income (derived from the investment of depositor funds and other Islamic banking operations), and other earnings assets (investment securities held for trading, investment securities available for sale, and investment securities held to maturity). The DEA indicated that the total technical efficiency of the banks was significantly influenced by pure technical efficiency (VRS). The Tobit regression analysis showed that most of the efficient banks were from high-income countries. A positive relationship existed between bank efficiency and loan intensity, size, capitalisation, and profitability, and the technically more efficient banks had larger market shares and lower non-performing loan ratios.

Said (2012b) studied 47 Islamic banks around the world from 2006–2009, to investigate their efficiency during the global financial crisis. The banks were grouped by region and size. Twenty-six were located in the Middle East, and 21 in non-Middle Eastern countries. Twenty-four had total assets of more than $600 million, and twenty three did not. The author applied CRS DEA with an intermediation approach. The input variables were labour cost, fixed assets, and total deposits. The output variables were total loans, liquid assets and other income. Using t-statistics with a 5% significant level, the study findings were that:

- there were no statistically significant differences between the efficiency of Islamic banks operating in the Middle East and in non-Middle Eastern countries during the global financial crisis (2007–2009);
- no statistically significant differences existed in the efficiency of Islamic banks based on their size during the global financial crisis;
- the efficiency of large Islamic banks increased from 2006 to 2008 and declined during 2009;

- the efficiency of smaller Islamic banks is less than that of larger Islamic banks; and
- the efficiency of Islamic banks located in the Middle East and in non-Middle Eastern countries increased during the time of the global financial crisis.

The author conducted year-by-year efficiency measurements to compare efficiency. Multi-year measurement for the total study period might have provided more appropriate findings.

Said (2013) compared technical efficiency of Islamic banks in the MENA countries with their credit, operational, and liquidity risks over the period 2006–2009. For the technical efficiency measurement, the author applied CRS DEA with an intermediation approach. Three inputs (labour cost, fixed assets, and total deposits) and three output variables (total loans, liquid assets, and other incomes) were used. Credit risk was represented by total debt to total assets; liquidity risk by equity capital divided by total assets; and operational risk by earnings before interest and tax (EBIT) divided by net total assets. The findings were that credit and operational risks were negatively correlated with efficiency levels, and that no significant correlation existed between liquidity risk and efficiency levels of Islamic banks in MENA countries.

All these 17 studies of Islamic banking efficiency, although they employed various methods, applied a non-parametric DEA model; two also applied a parametric SFA model and one applied DFA (another parametric model). DEA is widely used to analyse Islamic banking efficiency because, unlike the parametric model, it does not require a structured functional form, so it can eliminate misspecifications of the function. However, without a structured functional form, it is more likely to mis-identify measurement error and transitory differences in cost, or to identify error as inefficiency (Bauer et al., 1998). Most of the studies used similar input and output variables, and mainly, defined the inputs and outputs based on an intermediation approach (ten studies) or production approach (three studies). The researchers tended to incorporate an intermediation approach because it accommodates the intermediation characteristics of Islamic banking (Yudistira, 2003). Efficiency changes over time were also examined in the studies. MPI, or a single multiyear-frontier, was considered the appropriate method because DEA scores are calculated

in relation to the most efficient scores in the year of comparison. Separate year average efficiencies do therefore not provide good year-to-year comparisons. A summary of these studies is provided in Table 2.1.

DEA model is a common tool in measuring the efficiency of Islamic banks. Previous studies have applied DEA methodology using very similar input and output variables, based on the intermediation and production approach.

Table 2-1 Summary of studies of Islamic banking efficiency

No	Author	Samples	Period	Technique	Variables	General Finding
1.	Yudistira (2003)	18 Islamic banks across 12 countries including Indonesia	1997–2000	DEA with an intermediation approach	**Inputs:** Staff cost, fixed assets and total deposits **Outputs:** Total loans, other income and liquid assets	The Islamic banks in the sample suffered from the economic crisis in 1998–1999, followed by an increase in average efficiency thereafter.
2.	Al-Delaimi and Al-Ani (2006)	24 Islamic banks around the world	1999–2001	DEA	**Inputs:** Capital, capital reserves, and deposits **Outputs:** Investment and total assets	Most banks in the sample were efficient and the remaining banks were improving their cost efficiencies.
3.	Sufian (2006 & 2007)	17 Malaysian Islamic banks	2001–2005	DEA with a combined production and intermediation approach	**Inputs:** Total deposits and non-performing loans **Outputs:** Total loans and investments	The Malaysian Islamic banks had low scale efficiency Foreign Islamic banks were less efficient than domestic Islamic banks.
4.	Yaumidin (2007)	48 Islamic banks in Middle Eastern and South East Asian countries (including Indonesia)	2000–2004	DEA with an intermediation approach	**Inputs:** Overhead expenses, fixed assets, and total deposits **Outputs:** Total loans, other operating income, and total earning assets	Islamic banks in South East Asia were slightly more efficient than those in the Middle East.
5	Kamaruddin, Safa, and Mohd (2008)	2 Islamic banks and 12 Islamic windows in Malaysia	1998–2004	DEA to evaluate cost and profit efficiency	**Inputs for cost and profit efficiencies:** Labor, deposits, and physical capital **Input prices:** Price of labor, price of deposits, and price of physical capital **Outputs for cost efficiency:** Earning assets, liquid assets, and other income **Outputs for profit efficiency:** Profit before taxation and *zakat* (charity)	Islamic banks were relatively more efficient in the control of costs than in generating profits.

Table 2–1 Summary of studies of Islamic banking efficiency (continued)

No	Author	Samples	Period	Technique	Variables	General Finding
6.	Sufian, Noor, and Majid (2008)	37 Islamic banks in the Middle East and North Africa (MENA) and Asian countries	2001–2006	DEA with an asset approach	**Inputs:** Total deposits and assets **Outputs:** Total loans, income, and investment	Islamic banks in MENA region had a higher average technical efficiency than Asian Islamic banks. Furthermore for both regions, the technical inefficiency was due to the managerial inefficiency of the Islamic banks rather than size inefficiency.
7.	Sufian and Noor (2009)	37 Islamic banks in16 countries in the MENA region and in Asia	2001–2006	DEA	**Inputs:** Total deposits and physical capital **Outputs:** Total loans, income, and investments	The MENA Islamic banks showed a higher technical efficiency than Asian Islamic banks. The Islamic banks have been operating at a relatively optimal scale, but are managerially inefficient. Technically more efficient banks have smaller market shares and lower non-performing loan ratio.
8.	Ascarya, Yumanita, Achsani, and Rokhimah (2010)	Islamic banks in Indonesia and Malaysia	2002–2006	SFA, DFA, and DEA	**Inputs:** Total deposits, labor, and fixed assets **Outputs:** Total loans and total income	The average efficiency scores of the Indonesian Islamic banks were higher than those of the Malaysian banks.
9.	Ahmad, Noor, and Sufian (2010)	77 banks in 25 countries, including Bank Muamalat Indonesia	2003–2009	DEA with an intermediation approach	**Inputs:** Total loans, income, and other earning assets **Outputs:** Total deposits, labour cost, and total assets	Banks from high-income countries dominated the efficiency frontier.
10.	Moussawi and Obeid (2010)	23 Islamic banks in Gulf Cooperation Council (GCC) countries	2005–2008	DEA with aproduction approach	**Inputs:** Total deposits, total fixed assets, and labour costs **Outputs:** Total earning assets and net commission	The production efficiency of the banks in the sample increased during the study period.
11.	Ahmad and Noor (2011)	78 Islamic banks in 25 countries	1992–2009	DEA with an intermediation and asset approach	**Inputs:** Total deposits, labour cost, and total assets **Outputs:** Total loans, income, and other earning assets	The average efficiency of Islamic banks improved during the global financial crisis.

Table 2–1 Summary of studies of Islamic banking efficiency (continued)

No	Author	Samples	Period	Technique	Variables	General Finding
12.	Mostafa (2011)	87 Islamic banks (including Bank Muamalat Indonesia)	2009	DEA with an intermediation approach	**Inputs:** Total assets and equity **Outputs:** Net income, return on assets (ROA) and return on equity (ROE)	The average efficiency of the banks under investigation was 45.98% with a standard deviation of 31.61. The efficiency scores ranged from 1.42% to 100%. Bank Muamalat Indonesia, the only Indonesian bank in the sample, had a VRS score of 61.14%.
13.	Pramuka (2011)	Islamic commercial banks and IBUs in Indonesia	2003–2009	SFA DEA with an intermediation approach	**Inputs:** Total deposit, total overhead expense, and physical capital **Outputs:** Profit before taxation and financing volume	Islamic commercial banks were more efficient in generating profit than IBUs.
14.	Tahir, Bakar, and Haron (2011)	Islamic banks in Africa, Europe, the Far East, Central Asia, and the Middle East	2003–2008	DEA with an intermediation approach	**Inputs:** Total deposits and overhead expenses **Outputs:** Total loans and other earning assets	Islamic banks were more inefficient in controlling their resources than conducting operations at the right scale. There were statistically significant differences between the efficiency of large Islamic banks and small and medium banks.
15.	Noor and Ahmad (2012)	78 Islamic banks in the 25 countries, including Bank Muamalat Indonesia	1992–2009	DEA with an intermediation and asset approach	**Inputs:** Total deposits, labour cost, and total assets **Outputs:** Total loans, income, and other earnings assets	Most of the efficient banks were from high-income countries. A positive relationship existed between bank efficiency and loan intensity, size, and capitalisation.
16.	Said (2012b)	47 Islamic banks around the world	2006–2009	DEA with an intermediation approach	**Inputs:** Labour cost, fixed assets, and total deposits **Outputs:** Total loans, liquid assets and other income	The efficiency of Islamic banks located in Middle East and non-Middle East countries increased during the time of the global financial crisis .
17.	Said (2013)	Islamic banks in the MENA countries	2006–2009	DEA with an intermediation approach	**Inputs:** Labour cost, fixed assets, and total deposits **Outputs:** Total loans, liquid assets, and other income	Credit and operational risks were negatively correlated with efficiency levels, and no significant correlation existed between liquidity risk and efficiency levels of Islamic banks in MENA countries.

2.6 Previous research about the comparative efficiency of Islamic and non-Islamic banks

The comparative efficiency of Islamic and non-Islamic banks is an important issue, if we are to compare the efficiency of Islamic and non-Islamic banking. Batchelor and Wadud (2004) studied two fully-pledged Islamic banks and thirteen non-Islamic banks in Malaysia over the period 1997–2002. The non-Islamic banks consisted of nine domestic banks, and four foreign banks that also provided Islamic Banking Systems (IBS). The study applied DEA with an intermediation approach. The inputs were interest expenses (income attributable to depositors in the case of Islamic banks) and non-interest expenses. The output variables were net interest income (income from financing in the case of Islamic banks) and non-interest income. The findings were that the efficiency of foreign banks and domestic banks improved during the whole study period (1997–2002) and the efficiency of the fully-pledged Islamic banks declined due to scale inefficiency. The comparison would have been more representative if the authors had been able to obtain separate financial reports for the IBS division of the non-Islamic banks.

Ascarya and Yumanita (2007) compared Islamic and non-Islamic banks in Indonesia over the period 2003–2005. Applying DEA, they used total deposits, labour cost and fixed assets as inputs, and total loans and other income as outputs, finding that the Islamic banks were more efficient than the non-Islamic banks. Based on this, they argue that Islamic banks are able to compete with non-Islamic banks in Indonesia. A limitation of this research is that it only covered banks of comparable size: that is, non-Islamic banks with total assets of less than US$ 1 billion.

Bader et al. (2008) made a study of 43 Islamic banks and 37 non-Islamic banks over the period 1990–2005 in 21 members of OIC countries, including Indonesia. They used DEA with an intermediation approach to study comparative efficiencies in cost[15], revenue[16], and profit[17]. Three inputs (labour cost, fixed assets, and total

[15] A bank that is cost efficient for a given level of capital can create high-level income-generating assets and liabilities (Bader et al., 2008)

[16] A bank is revenue efficient if it can generate a high level of income from its services with a given level of inputs.

deposits + total borrowed funds) and three outputs (total loans, other earning assets, and off-balance sheet items) were used. The research found that no statistically significant differences in the cost, revenue, and profit efficiency measurements of Islamic and non-Islamic banks, and no statistically significant differences between Islamic and non-Islamic banks based on size (big and small) or period of establishment (old and new). Using the Kruskal-Wallis test at a 5% level of significance, they found statistically significant differences between Islamic and non-Islamic banks in some regions (Africa, Asia, the Middle East and Turkey) in terms of the profit and revenue efficiency scores. However, this finding is inconclusive because the Kruskal-Wallis test only suggests a difference (or differences) in k-independent samples without indicating which of the samples are different (Siegel & Castellan, 1988); it has to be followed by a Mann–Whitney test to determine this. In this research, they did not conduct the Mann-Whitney test.

Mokhtar, Abdullah, and Alhabshi (2008) compared the efficiency of two fully fledged Islamic banks, twenty Islamic windows, and twenty non-Islamic banks in Malaysia during 1997–2003. They measured technical and cost efficiency by applying DEA with an intermediation approach, using total deposits and total overhead expenses as input variables. Total earning assets (loans, dealing securities, investment securities, and placements with other banks) were used as output variables. They found that the efficiency of Islamic banks increased from 1997 to 2003, and that fully fledged Islamic banks were more efficient than Islamic windows, but less efficient than non-Islamic banks.

Studying Islamic and non-Islamic banks in the GCC region during 2000–2005, Olson and Zoubi (2008) found that Islamic banks were more profitable than non-Islamic banks but less efficient, based on their financial ratios for profitability measurements. Olson and Zoubi used return on assets, return on equity, profit margins, return on deposits, return on shareholder capital, and net operating margins. For the efficiency comparisons they used interest income to expenses, operating expenses to assets,

[17] A bank is profit efficient if it can generate a high level of income from its intermediation operation with a given level of inputs.

operating income to assets, operating expenses to revenue, asset turnover, net interest margins, and net non-interest margins**.**

Hassan, Mohamad, and Bader (2009) compared the efficiency of Islamic and non-Islamic banks in the Middle East during 1990–2005, investigating forty banks from eleven OIC countries using DEA. They used labour cost, fixed assets, and total funds (total deposits and total borrowed funds) as inputs. Total loans, other earnings assets, and off-balance sheet items were the output variables. Utilising the Mann–Whitney test with a *p*-value of 5%, their study showed no significant differences between the Islamic and non-Islamic banks included in the research.

Afiatun (2010) compared three Islamic banks and ten non-Islamic banks of similar size in Indonesia during 2004–2009. The author applied input oriented VRS DEA with an intermediation approach. The Malmquist Productivity Index was used to measure changes of productivity over time. The author used total deposits and total overhead expenses as inputs, while total loans and other earning assets were used as outputs. The study showed that the average efficiency scores of Islamic banks (86.01%) was lower than that of non-Islamic banks (87.09%) over the period 2004 to 2009. Despite this, the *t*-test result shows that the differences between the efficiency of Islamic and non-Islamic banks were not statistically significant**.**

Miniaoui and Tchantchane (2010) conducted efficiency measurements of forty four banks (eight Islamic banks, twenty banks with Islamic windows, and sixteen non-Islamic banks) in GCC countries during 2005–2008. The authors applied DEA with total assets and total equity as input variables and net profit as output variable. To compare the performance of the banks over different time periods, they employed Dynamic DEA as suggested by Cullinane et al. (2005).[18] Their study found that the Islamic banks were slightly more efficient than the other two groups.

A study by Kashani and Obay (2010) found no statistically significant efficiency differences between Islamic and non-Islamic banks in the GCC region over the period 2000–2005. They applied DEA with a production approach. The input

[18] Dynamic DEA is a single multiyear-frontier DEA. See Section 3.9.2.

variables were personnel expenses, other operating expenses (including those incurred for premises and fixed assets), and interest expenses (or return to depositors in the case of the Islamic banks). The output variables were earning assets, total deposits, and operating income.

Ika and Abdullah (2011) compared the performance of three Islamic banks and six non-Islamic banks in Indonesia over the period 2000–2007. Two efficiency ratios were used to compare the groups: first the Asset Utilisation ratio was used to measure the capability of banks to generate revenue utilising their assets; and second the Operating Efficiency ratio was used to indicate how well expenses were managed. It was found that no significant differences existed in the efficiency of Islamic and non-Islamic banks in Indonesia.

Ahmad and Rahman (2012) examined the relative efficiency of two Islamic and eight non-Islamic banks in Malaysia over the period 2003–2007. The study applied DEA with an intermediation approach. The inputs were personnel expenses, capital (net book value of property, plant, and equipment), and total deposits; the output variables were loans plus advances (loans, advances and financing) and total income (total interest income, non-interest income, and income from Islamic banking scheme operations). The difference in the efficiency scores of the bank types were analysed. The finding was that the non-Islamic banks were more efficient than the Islamic banks because of better managerial efficiency and technological advancement. The authors considered scale inefficiency to be the main factor leading to the low technical efficiency of the Islamic banks, as their average size was relatively less than that of the non-Islamic banks.

A study by Al-Khasawneh, et al. (2012) compared the cost and revenue efficiencies of nine Islamic banks and eleven non-Islamic banks in Tunisia, Algeria, Egypt, and Sudan over the period 2003–2006. The authors applied VRS DEA with three inputs, personnel expenses, fixed assets, and loanable funds (the sum of demand and time deposits and non-deposits funds). The price of labour was calculated as personnel expenses over total assets; the price of capital as non-interest expenses over total assets; and the price of funds as total interest expense over loanable funds. The output variables were net loans and other earning assets. The price of loans was defined as total interest income to net loans; and the price of other operating income

as other operating income to other earning assets. The findings were that during those years:

- the revenue efficiency of Islamic banks was higher than that of non-Islamic banks;
- the revenue efficiency growth rate of non-Islamic banks was higher than that of Islamic banks;
- cost efficiency varied from country to country for Islamic banks.
- the cost efficiency of Islamic and non-Islamic banks was almost on the same level, but Islamic banks showed a larger decrease in cost efficiency over the study period; and
- Islamic banks were generally more revenue-efficient but achieved lower efficiency improvement than non-Islamic banks.

This study applied separate annual frontier measurements, which is not an appropriate method to compare efficiency changes from year to year. Applying a single-multiyear frontier to analyse changes in efficiency over time might have been more suitable.

Hadad et al. (2012) investigated the efficiency of the Indonesian banking industry in Indonesia during 2003–2007.[19] The study applied the DEA intermediation approach twice, with different input combinations but the same output variables. The input variables for the first model were total consumer deposits and commercial borrowing (demand deposits + saving deposits + time deposits + liabilities to Bank of Indonesia + inter-bank liabilities + securities issued + borrowings + other payables + guarantee deposits + inter office liabilities); total employee expenses (total salaries and wages + total educational spending); total non-employee expenses (expenditure on R&D + rent + promotion + repair and maintenance + goods and services + other costs), and total loan loss provisions (allowances for loan losses). This model also incorporated loan loss provisions as the risk control variable to cover expected losses. The second model incorporated equity capital as the risk control variable to cover both expected

[19] For the year 2007, there are 130 banks including three Islamic banks.

and unexpected losses. The input variables for the second model were total consumer deposits and commercial borrowing, total employee expenses, total non-employee expenses, and equity capital.

For both these sets, the same output variables were applied: total loans (total customer loans), total other earning assets (placements in Bank of Indonesia + interbank assets + securities held + other claims + equity participation + cash) and net total off-balance sheet income (net income from dividends/ fees/ commissions / provisions + net income from forex/ derivative transactions + (securities appreciation - securities depreciation) - insurance expenses - capital market transactions). A third set of output variables was included to proxy the non-traditional business activities of Indonesian banks.

The study found that in model 1, the average efficiency of Islamic banks was slightly lower than the overall banking industry average (0.561 compared to 0.593). In model 2, they also showed lower efficiency (0.533 compared to 0.625). These imply that Islamic banks in Indonesia were not as good as non-Islamic banks in dealing with unexpected losses. In this study, the authors applied the semi-oriented methodology for the treatment of negative data.[20]

Haque and Tariq (2012) studied the efficiency of six Islamic banks and 16 non-Islamic banks in Pakistan over the period 2006–2010. Their research consisted of a DEA intermediation approach with three inputs (administrative costs, operating fixed assets, and total deposits) and three outputs (investment and financing, total income, and liquid assets). According to the findings the efficiency of the banking sector in Pakistan (represented by banks in the sample) decreased from 2006 to 2009 because of the global financial crisis, with the overall CRS efficiency score falling from 100% in 2006 to 73.2% in 2009. The CRS score of the non-Islamic banks sank from 100% in 2006 to 59.9% in 2009, but these banks were able to maintain a high efficiency during this period: their CRS efficiency score never moved below 92%.

[20] Hadad et al. (2012) note alternative ways to deal with negative values in DEA: to transform or translate the data by adding a sufficient value to the data; to treat absolute negative inputs or outputs as outputs or inputs respectively; or to use range directional measures.

These findings indicate that the level of efficiency of the Islamic banks exceeded that of the non-Islamic banks during the global financial crisis.

Said (2012a) compared changes in the efficiency of 47 Islamic banks around the world and 106 non-Islamic banks in the USA during the global financial crisis. Their 2006 efficiencies served as benchmark for the comparison of changes. Non-Islamic banks in the study were 58 small commercial banks with total assets below $100 million and 48 large commercial banks with assets over $1 billion. The author applied CRS DEA with an intermediation approach. The input variables were labour cost, fixed assets, and total deposits; the output variables were total loans, liquid assets, and other income. Statistically significant differences were found between the changes in the efficiency of small and large non-Islamic banks in 2008 and 2009. There were also statistically significant differences in the changes in efficiency of Islamic and small non-Islamic banks. The efficiency measurement in this study was conducted separately for each year and each bank type. The year-to-year comparison seems an unusual approach, as it would seem to be more appropriate to apply a single–multiyear frontier to analyse changes in efficiency over time.

Yahya, Muhammad and Hadi (2012) compared the efficiency of nine Islamic banks and 20 non-Islamic banks in Malaysia over the period 2006–2008. DEA with an intermediation approach was used to measure the relative efficiency of the banks. Four inputs were used: total deposits, fixed assets, other earning assets, and overheads cost. The output variables were total loans, interest revenue, and net income. The Islamic banks, on average, had a higher efficiency score than the non-Islamic banks over the study period. The independent *t*-test results indicated a statistically significant difference between the efficiency level of Islamic and non-Islamic banks in 2006, but no statistically significant differences in 2007 and 2008.

Beck, Demirgüç-Kunt and Merrouche (2013) compared 88 Islamic banks and 422 non-Islamic banks in 22 countries over the period 1995–2007. The authors analysed differences in efficiency, business orientation, asset quality, and stability. The efficiency levels were measured using total operating costs divided by total assets and overhead costs relative to gross revenues. The findings were that, considering the different countries and different years over which the research was conducted, Islamic banks had higher cost-income ratios, higher overhead costs, higher loan-

deposit ratios, lower non-performing loans, and higher capital-asset ratios than non-Islamic banks. The authors concluded that Islamic banks were less efficient but had higher intermediation ratios and better asset quality, and were better capitalised than non-Islamic banks. They stated that Islamic banks outperformed non-Islamic banks during the global financial crisis because they had better capitalisation and better asset quality.

As in the studies of Islamic banks alone, the DEA model was a popular tool for comparing the efficiency of Islamic and non-Islamic banks. Of the 17 studies discussed in this section, DEA was used in 14. The input and output variables were mainly defined based on the intermediation approach, and are found explicitly in nine studies. Researchers found different results regarding the comparative efficiency of Islamic and non-Islamic banks. The studies by Ahmad and Rahman (2012), Beck, Demirgüç-Kunt and Merrouche (2013), Hadad et al. (2012), Mokhtar, Abdullah, and Alhabshi (2008), and Olson and Zoubi (2008) suggest that Islamic banks were less efficient compared to their non-Islamic counterparts. In contrast, the studies by Al-Khasawneh et al. (2012), Ascarya and Yumanita (2007), Haque and Tariq (2012), Miniaoui and Tchantchane (2010) and Yahya, Muhammad and Hadi (2012) find the Islamic banks to have been more efficient. However, few of those findings were supported by statistical evidence. Only the study by Yahya, Muhammad, and Hadi (2012) provides evidence that Islamic banks were more efficient than non-Islamic banks, and their difference is statistically significant. On the other hand, studies by Afiatun (2010), Bader, Mohamad, Ariff, and Hassan (2008), Hassan, Mohamad and Bader (2009), Ika and Abdullah (2011), and Kashani and Obay (2010) suggest that there were no statistically significant differences in the efficiency of Islamic and non-Islamic banks. This information is summarised in Table 2.2.

Table 2-2 Summary of studies about Islamic and non-Islamic banking efficiency

No	Author	Country	Period	Technique	Variables	General Finding
1.	Batchelor and Wadud (2004)	2 fully-pledged Islamic banks and 13 non-Islamic banks in Malaysia	1997–2002	DEA with an intermediation approach	**Inputs:** Interest expenses and non-interest expenses **Outputs:** net interest income and non-interest income	The efficiency of foreign banks and domestic banks improved during the study period. The efficiency of fully-fledged Islamic banks declined due to scale inefficiency.
2.	Ascarya and Yumanita (2007)	Islamic and non-Islamic banks in Indonesia	2003–2005	DEA	**Inputs:** Total deposits, labour cost and fixed assets **Outputs:** Total loans and other income	Islamic banks are more efficient than non-Islamic banks.
3.	Bader, Mohamad, Ariff, and Hassan (2008)	43 Islamic banks and 37 non-Islamic in 21 OIC countries (including Indonesia)	1990–2005	DEA with an intermediation approach	**Inputs for cost, revenue, and profit:** Labour cost, fixed assets, and total deposits + total borrowed funds **Outputs cost, revenue, and profit:** Total loans, other earning assets and off balance sheet items	There were no statistically significant differences in the cost, revenue and profit efficiency measurements of Islamic and non-Islamic banks. There were statistically significant differences between Islamic and non-Islamic banks in different regions, in terms of profit and revenue efficiency.
4.	Mokhtar, Abdullah, and Alhabshi (2008)	2 full-fledged Islamic banks, 20 Islamic windows, and 20 non-Islamic banks in Malaysia	1997–2003	DEA with an intermediation approach	**Inputs:** Total deposits and total overhead expenses **Output:** Total earning assets	The fully fledged Islamic banks were more efficient than the Islamic windows, but less efficient than non-Islamic banks.

Table 2–2 Summary of studies about Islamic and non-Islamic banking efficiency (continued)

No	Author	Country	Period	Technique	Variables	General Finding
5.	Olson and Zoubi (2008)	Islamic and non-Islamic banks in GCC region	2000–2005	Financial ratios	**Profitability measurements:** Return on assets; return on equity; profit margins; return on deposits; return on shareholder capital; and net operating margins **Efficiency measurements:** Interest income to expenses; operating expenses to assets; operating income to assets; operating expenses to revenue; asset turnover; net interest margins; and net non-interest margins.	Islamic banks are more profitable than non-Islamic banks but less efficient based on their financial ratios for profitability measurements.
6.	Hassan, Mohamad and Bader (2009)	22 Islamic and 18 non-Islamic banks in 11 OIC countries.	1990–2005	DEA	**Inputs:** Labour cost, fixed assets, and total funds **Outputs:** Total loans, other earnings assets and off-balance sheet items	There are no significant differences between the Islamic and the non-Islamic banks included in the research.
7.	Afiatun (2010)	3 Islamic banks and 10 non-Islamic banks of similar size in Indonesia	2004–2009	DEA with an intermediation approach. Malmquist Productivity Index	**Inputs:** Total deposits and total overhead expenses **Outputs:** Total loans and other earning assets	The differences between the efficiency of Islamic and non-Islamic banks were not statistically significant.
8.	Miniaoui and Tchantchane (2010)	8 Islamic banks,12 banks with Islamic windows, and16 non-Islamic banks in GCC region	2005–2008	DEA	**Inputs:** Total assets and total equity **Output:** Net profit	Islamic banks were slightly more efficient than the other two groups.

Table 2–2 Summary of studies about Islamic and non-Islamic banking efficiency (continued)

No	Author	Country	Period	Technique	Variables	General Finding
9.	Kashani and Obay (2010)	Islamic and non-Islamic banks in GCC Region	2000–2005	DEA with a production approach	**Inputs:** Personnel expenses, other operating expenses, and interest expenses **Outputs:** Earning assets, total deposits, and operating income	There were no statistically significant efficiency differences between Islamic and non-Islamic banks in the GCC region.
10.	Ika and Abdullah (2011)	3 Islamic banks and 6 non-Islamic banks in Indonesia	2000–2007	Financial ratios	**Asset Utilisation ratio** = Total operating income/ total asset **Operating Efficiency ratio** = Total operating expenses/ total operating income	There were no significant differences existed between the efficiency of Islamic and non-Islamic banks in Indonesia.
11.	Ahmad and Rahman (2012)	2 Islamic and 8 non-Islamic banks in Malaysia	2003– 2007	DEA with an intermediation approach	**Inputs:** Personnel expenses, capital, and total deposits **Outputs:** Loans plus advances and total income	The non-Islamic banks were more efficient than the Islamic banks due to better managerial efficiency and technological advancement.

Table 2–2 Summary of studies about Islamic and non-Islamic banking efficiency (continued)

No	Author	Country	Period	Technique	Variables	General Finding
12.	Al-Khasawneh et al. (2012)	9 Islamic banks and 11 non-Islamic banks in Tunisia, Algeria, Egypt, and Sudan	2003–2006	DEA	**Inputs for cost and revenue efficiencies:** Personnel expenses, fixed assets, and loanable funds **Input prices:** Price of labour = personnel expenses/ total assets; Price of capital = non-interest expenses/ total assets; Price of funds = total interest expense/ loanable funds **Outputs:** Net loans and other earning assets **Output prices:** Price of loans = total interest income/ net loans; Price of other operating income = other operating income/ other earning assets	Islamic banks are generally more revenue efficient but achieved lower efficiency improvements than non-Islamic banks.
13.	Hadad, Hall, Kenjegalieva, Santoso, and Simper (2012)	Islamic and non-Islamic banks in Indonesia	2003–2007	DEA intermediation approach	**Inputs for Model 1:** Total consumer deposits and commercial borrowing, total employee expenses, total non-employee expenses, total loan loss provisions **Inputs for Model 2:** Total consumer deposits and commercial borrowing, total employee expenses, total non-employee expenses, equity capital **Outputs:** Total loans, total other earning assets, and net total off-balance sheet income	The average efficiency of Islamic banks is lower than the overall banking industry. Islamic banks in Indonesia were not as good as non-Islamic banks in dealing with unexpected losses.

Table 2–2 Summary of studies about Islamic and non-Islamic banking efficiency (continued)

No	Author	Country	Period	Technique	Variables	General Finding
14.	Haque and Tariq (2012)	6 Islamic banks and 16 non-Islamic banks in Pakistan	2006–2010	DEA with an intermediation approach	**Inputs:** Administrative costs, operating fixed assets, total deposits **Outputs:** Investment and financing, total income, liquid assets	During the global financial crisis, the level of efficiency of the Islamic banks exceeded that of the non-Islamic banks.
15.	Said (2012a)	47 Islamic banks around the world and 106 non-Islamic banks in the USA	2006– 2009 Their 2006 efficiencies served as criteria for comparison of changes	DEA with an intermediation approach	**Inputs:** Labour cost, fixed assets, and total deposits **Outputs:** Total loans, liquid assets, and other income	There were statistically significant differences in the changes in the efficiency of the Islamic and small non-Islamic banks .
16.	Yahya, Muhammad, and Hadi (2012)	9 Islamic banks and 20 non-Islamic banks in Malaysia	2006–2008	DEA with an intermediation approach	**Inputs:** Total deposits, fixed assets, other earning assets, and overheads cost **Outputs:** Total loans, interest revenue, and net income	Islamic banks had a higher efficiency score than the non-Islamic banks. There was a statistically significant difference between the efficiency level of Islamic and non-Islamic banks in 2006.
17.	Beck, Demirgüç-Kunt, Merrouche (2013)	88 Islamic banks and 422 non-Islamic banks in 22 countries around the world	1995–2007	Financial ratios	**Efficiency level measurements:** Total operating costs divided by total assets and overhead costs relative to gross revenues	Islamic banks were less efficient, but had higher intermediation ratios, better asset quality, and were better capitalised than non-Islamic banks. Islamic banks outperformed non-Islamic banks during the 1990s financial crisis.

From the discussion in this section, it is evident that Islamic and non-Islamic banks can be compared based on the information from financial reports. DEA is a common and prominent approach to compare the efficiency of Islamic and non-Islamic banks.

2.7 SUMMARY

Although Indonesian Islamic banking is growing faster than non-Islamic banking, its growth is still lower than forecasted by the Indonesian Central Bank, and considering that that Muslims represent 87% of the population and something near this proportion of banking might reasonably be expected to be Islamic. Given this assumption, this research will determine whether Indonesian Islamic banks differ from non-Islamic banks in terms of their efficiency; it will analyse the impact of efficiency differences on the total asset growth of Indonesian Islamic banks, and determine the variables that significantly affect the growth of Indonesian Islamic banks. This should assist in finding answers to the lower than expected growth of this banking sector.

Differences pertaining to the format and content of financial information provided by Islamic and non-Islamic banks have been investigated here. The reporting standards for non-Islamic banks are based on the International Financial Reporting Standards, while Islamic banks and financial institutions comply with AAOIFI. Core operational differences between the two bank types are implicated in their differences, so it is necessary to map the financial report formats for both types of bank and make adjustments before it is possible to compare their financial information.

Numerous researchers have applied DEA to measure Islamic bank efficiency and to compare it with that of non-Islamic banks. Intermediation and production are the predominant DEA approaches that have been applied. No previous research has focused on the reasons for differences in the comparative growth of Islamic and non-Islamic banks.

This research will incorporate a new approach to DEA efficiency measurement, focusing on stakeholder efficiency in all banks and comparing Islamic and non-Islamic banks with each other. Regression analysis will be applied to determine the significance of the different components of stakeholder efficiency with regard to the

growth of Islamic banking in Indonesia. This research will also apply the efficiency scores obtained from the DEA measurement in a regression model to answer the question of why the growth of Indonesian Islamic banks is so far below expectation.

Chapter 3
RESEARCH METHODOLOGY

3.1 Introduction

Globally, Islamic banking grew by of 23% per annum over the period 1997 to 2007 (Ibrahim, 2007). In Indonesia too, Islamic banking has grown relatively faster than non-Islamic banking, and from 2001 to 2010, average growth was more than 50% per annum, compared to 13% for non-Islamic banks over the same period. Despite this actual growth of Indonesian Islamic banking has been much lower than predicted (Bank Indonesia; Karim Business Consulting, 2004).

This chapter details about the methodology that will be applied to assess whether there are efficiency differences between Indonesian Islamic and non-Islamic banks that may impact on the growth of the Islamic banking sector, and to observe the contribution of specific variables to the prevailing growth. In this study the efficiency of Islamic and non-Islamic banks is measured in terms of the stakeholder objectives contained in their vision and mission statements. These statements serve as benchmarks for achievement, since such vision and mission statements reflect the 'purpose for being' and 'reason for being' of each bank (Carpenter, Bauer & Erdogan, 2009).

DEA is first applied to compare the different stakeholder efficiencies of the Indonesian Islamic and Non-Islamic banks, and regression analysis is then introduced to the DEA efficiency comparison to determine whether the different stakeholder efficiencies contribute significantly to their growth rates. The research methodology elements are presented Figure 3.1 and discussed in detail in the ensuing sections of this chapter.

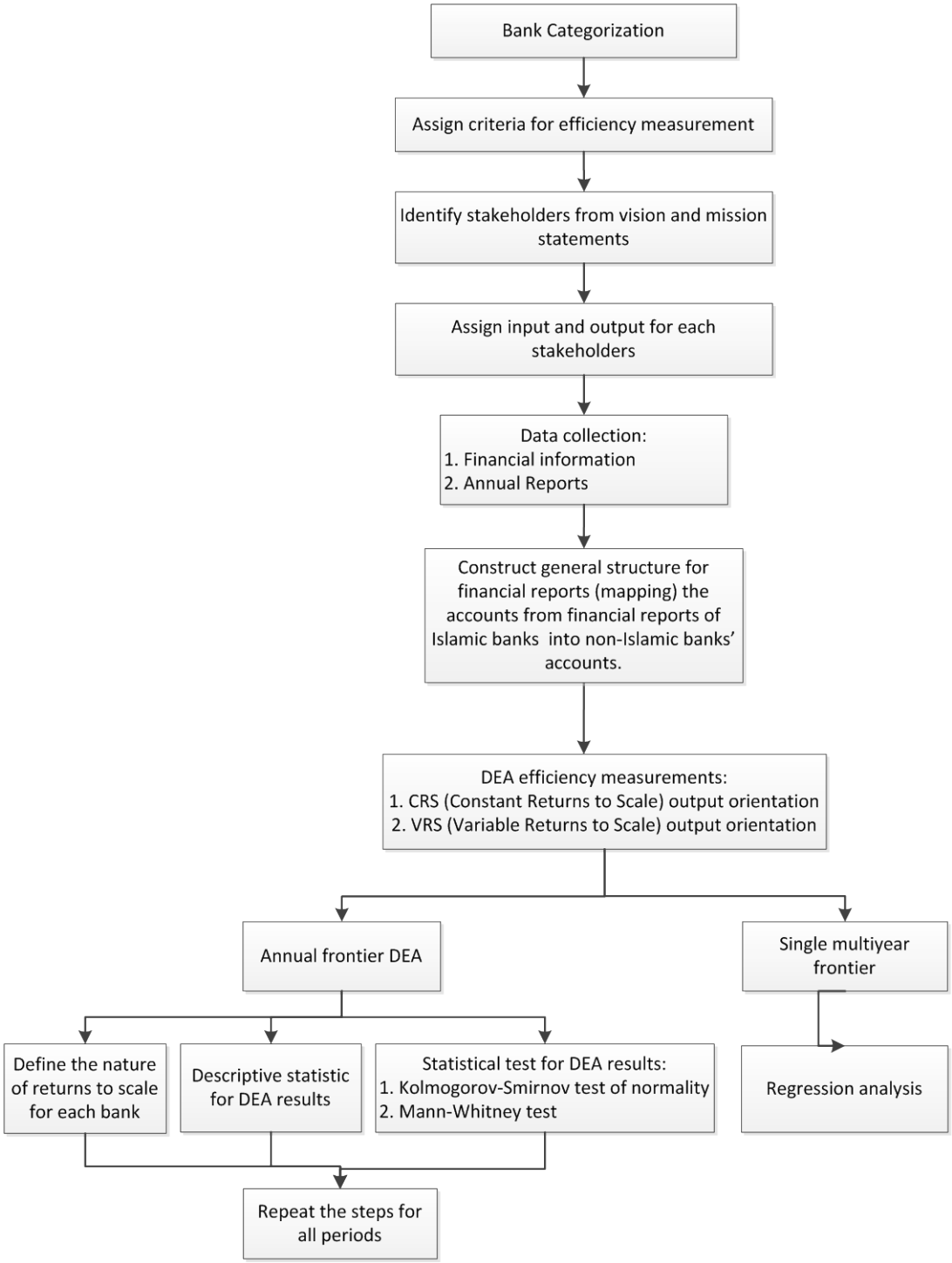

Figure 3-1 Flow chart of research methodology applied

3.2 Bank categorisation

The Indonesian commercial banking classification of banks as Islamic and non-Islamic, used by Bank Indonesia (2012), applies in this research. Islamic commercial banks and the business units (IBUs) forming a separate part of the operational units of some non-Islamic banks, represent the Islamic bank category; all banks not applying Islamic principles are categorised as non-Islamic.

3.3 Criteria for efficiency measurement

As discussed previously, DEA is a prominent tool of efficiency measurement. However, there are no generally accepted techniques to measure bank efficiency (Wheelock & Wilson, 1995). Favero and Papi (1995) note that there is no consensus among researchers in defining inputs and outputs in banking efficiency measurements using DEA; and this research takes advantage of this lack of strictness to apply a new approach.

Vision and mission statements are important to any organisation, including banks. According to Carpenter et al. (2009), the vision statement is a future-oriented declaration which states the purpose for being of an organisation, while the mission statement declares an organisation's reason for being and communicates how an organisation aims to serve its key stakeholders.

Bart, Bontis, and Taggar (2001) indicate that there is a significant correlation between the mission statements of organisations and their performance. They constructed a model that explains the relationship between mission statements and the performance of organisations, tested with data from 83 large Canadian and US organisations; their findings show that mission statements can affect the financial performance of organisations. Financial performance was measured by the degree of satisfaction top managers had about the financial performance of their firms (i.e. sales, profit, growth, and margin). The level of satisfaction was found to be positively and significantly correlated with return on sales (ROS) and return on assets (ROA) of each organisation. Commitment to the mission, as well as the compatibility of the internal structure, policies, and procedures of the organisation with the mission statement, was found to be an important determinant of employee

behaviour, which in turn had direct impact on the financial performance of the organisations.

A study by Williams (2008) investigated the mission statements of Fortune 1000 higher-performing and lower-performing organisations, finding that the first group of organisations included eight of nine recommended components in their mission statements more often than did the lower-performing group. These recommended components were customers, products or services, location, technology, concern for survival, philosophy, self-concept, concern for public image, and concern for employees: all important to create identity (internal ethos) and image (external ethos) to improve the performance of an organisation.

A link between mission statement and performance is also found in developing countries such as Iran, where Gharleghi, Nikbakht and Bahar (2011) found a significant and positive correlation between the quality of their mission statements and the performance of small and medium enterprises. The characteristics noted in the study as indicators of quality were the clearness of the statements; their completeness; their practicality; their reality; their flexibility; the extent to which employees and managers were aware of them; the extent to which the statements were accepted; consideration of the stakeholders in the statements; and the distinctiveness of each enterprise's mission statement.

Investigating 22 European firms, 15 Japanese firms, and 19 US firms from the Fortune Global 500 list, Bartkus, Glassman and McAfee (2004) found five stakeholder groups cited in the various mission statements: customers (cited in 67.9% mission statements), society (cited in 37.5% mission statements), employees (cited in 37.5% mission statements), investors (cited in 30.4% mission statements), and suppliers (cited in 7.1% mission statements).

Vision and mission statements serve as important indicators of the objectives of organisations. Therefore, individual banks' regard for the individual components of their vision and mission statements serves as a good measure of their efficiency. A mission statement communicates how an organisation aims to serve its key stakeholders (Carpenter et al., 2009).

3.4 Identification of stakeholders from vision and mission statements

During September 2011 the websites of the 68 non-Islamic and seven Islamic banks included in this research were scrutinised to retrieve their vision and mission statements. The 75 websites were the total number of such sites available, representing 68.4% (68/ 109 non-Islamic banks) and 63.6% (7/ 11 Islamic banks) in the year 2011. These vision and mission statements identify the following stakeholders:

a. Customers: in 53 (78%) vision and mission statements of non-Islamic banks and 6 (86%) of Islamic banks.
b. Communities: in 46 (68%) vision and mission statements of non-Islamic banks and 5 (71%) of Islamic banks.
c. Employees: in 21 (31%) vision and mission statements of non-Islamic banks, and 5 (71%) of Islamic banks.
d. Shareholders: in 11 (16%) vision and mission statements of non-Islamic banks; are none mentioned in the mission statements of Islamic banks.

Not all banks explicitly mention specific stakeholders in their vision and mission statements, some mention stakeholders in a broad way and could encompass different groups of stakeholders. For example, the mission statement of PT. Bank Muamalat Indonesia (an Islamic bank) is 'To become a ROLE MODEL [original capitalisation] among the world's *Sharia* financial institutions, emphasising in entrepreneurial spirit, managerial excellence, and innovative investment orientation to maximise value to stakeholders.'

The extent to which the Islamic banks in this research include different stakeholders in their vision and mission statements shows similar results with the findings of Bartkus et al. (2004) that customers are most included and shareholders least included. The vision and mission statements included in this research indicate that customers seem to be regarded as the most prominent stakeholders, followed by the community, for both Islamic and non-Islamic banks. Employees are mentioned in only 31% of the vision and mission statements of non-Islamic banks, but in 71% of those of Islamic banks. The reason for the low number of vision and mission statements mentioning employees in the case of non-Islamic banks is unknown; it is

slightly lower than the 37% found seven years previously by Barkus et al. (2004). Yet 71% of Islamic banks included employees in their vision and mission statements –very similar to the high number of mentions of customers and community. This is consistent with the explicit social mission of Islamic banks since their inception.

The low level of inclusion of shareholders in the vision and mission statements of non-Islamic banks is strange, considering that they are the actual 'owners' of the banks; they do appear in the earlier findings Barkus et al. (2004). Shareholders are not relevant in the case of Islamic banks, and no Islamic bank mentions shareholders explicitly in its vision and mission statements.

Four stakeholder groups are explicitly identified on the content of the vision and mission statements of the different banks. Notwithstanding the fact that employees in non-Islamic banks and shareholders are given low prominence, they are still regarded as stakeholders for this research. The reason is that in the economic approach to corporate governance, these groups have economic assets (i.e. employees with skills and investors or shareholders with money) which are used to produce returns (Boatright, 2006).

The efficiency of banks with regard to the individual components of the vision and mission statements, in this case the stakeholders, serves as a good measure of their efficiency; therefore appropriate inputs and outputs for the DEA efficiency measurement of all four identified stakeholders will be used.

3.5 Determining the inputs and outputs that represent bank efficiency for different stakeholders

The measures applied to determine the efficiency of banks regarding the different stakeholders that they serve entails the identification of output variables that reflect stakeholder reaction to the service/ effort in terms of inputs that the banks apply to create the outputs. The relevant inputs and outputs identified for each stakeholder are contained in Table 3.1.

Table 3-1 Input and output variables selected as indicators of each stakeholder efficiency

Stakeholders	Input	Output
Customer	Total number of branches	Total loans
	Number of employees	Total deposits
Community	Total number of branches	Total loans
	Number of employees	Total deposits
Employee	Personnel expenses	Profit before tax (net income before tax)
	Number of employees	Total loans
		Total deposits
Shareholders	Interest expense/ Total assets	Interest income/ Total assets
	Non-interest expense/ Total assets	Non-interest income / Total assets

Marketing plays a definite role in banking growth but is not directly considered. This can be regarded as a limitation since the focus is on available data that can be quantified for determining Islamic versus Non-Islamic stakeholder efficiency. Furthermore, this study analysed the differences between Islamic and non-Islamic banks using the traditional employee based efficiency measures. For example, number of branches and employees are used as efficiency measures instead off technology such as internet banking. The unavailability of some data, like the number of auto-teller machines, community projects performed by banks, etc., is unfortunate, as these would serve as very appropriate bank inputs that might be applicable to the community as stakeholders.

The variables available for study are, unfortunately, limited by the availability of data and the efficiency measurement for customers and the community is combined for the purposes of this research. The inputs used for Customer–community efficiency are the total number of branches of banks and their number of employees. Total number of branches is regarded as an applicable input variable because it shows the accessibility of the bank to the community and its customers. The number of employees shows the number of people available to serve customers and the community. On the other side of the equation, loans and total deposits are used as outputs for Customer–Community efficiency since they provide an indication of how well the bank is supported by this group (that is, are satisfied with the service of the

bank). This is based on the assumption that if customers and community are satisfied with a bank, it will have high levels of loans and total deposits compared to its inputs (i.e. the bank will have a high Customer–Community efficiency).

For Employee efficiency, number of employees and staff expenses are used as input variables. The output variables (loans, total deposits, and NIBT) are indicators of how well the employees are performing their jobs. The higher the loans, total deposits, and NIBT of a bank compared to the number of employees and staff expenses, the higher the level of Employee efficiency.

For shareholders, profit is regarded as the appropriate outcome; therefore interest- and non-interest expenses are used as input variables and interest- and non-interest income as output variables. All variables are expressed as a percentage of total assets to eliminate size differences between banks for analysis purposes. The higher the income of banks compared to their expenses, the higher the Shareholder efficiency.

All these variables will be applied in the DEA efficiency measurement conducted in this research.

3.6 DEA and regression data collection

Data from 2001 to 2010 was collected for this research. In Indonesia, the financial year is the same as the calendar year. All commercial Islamic and non-Islamic banks in Indonesia for which data was available were included. As already noted, Islamic banks consist of both independent commercial banks and business units (IBUs) owned by non-Islamic banks.

Table 3.2 shows the number of commercial banks in Indonesia from 2001–2010, and Table 3.3 shows for how many of them data is available for the respective years. The number of banks in Indonesia was obtained from the official website of Bank Indonesia (www.bi.go.id), except for 2001, which was obtained from *Infobank Indonesia* magazine.

Table 3-2 Number of banks in Indonesia

No	Type of Bank	Number of Banks									
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	Non-Islamic	143	139	136	130	128	127	127	119	115	111
2	Islamic	2	2	2	3	3	3	3	5	6	11
3	Islamic banking unit	3	6	8	15	19	20	26	27	25	23

Table 3-3 Number of banks in Indonesia with all data available

No	Type of Bank	Numbers of Available data									
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	Non-Islamic	19	51	105	99	115	103	103	112	107	109
2	Islamic	2	2	2	3	3	3	3	3	6	11
3	Islamic banking unit	1	6	7	15	17	20	26	27	25	23

It is immediately evident that data for 2001 and 2002 is very limited[21], as the database of the provider of the information (Bank Indonesia), does not contain data of all banks for these years; and therefore this research utilises the data from 2003 to 2010. The change in the start year is supported by the fact that the accounting guidelines for Indonesian Islamic banking (*Pedoman Akuntansi Perbankan Syariah Indonesia*) were not introduced by Bank Indonesia until 2003. Before this, Islamic banks used the same accounting guidelines as their non-Islamic counterparts. The changes introduced in 2003 simplify the extraction of the multi-year data variables required for the DEA and regression analysis.

Data collected for the research consists of:

a. Financial statements (balance sheets and income statements) for commercial banks in Indonesia
b. The number of employees for each bank
c. The total branch numbers for each bank.

[21] Interview evidence from a former private bank director suggested that the data base was not well updated, especially in 2001 and 2002.

Each of these will be discussed in ensuing sections.

3.7 Financial information

In this research, balance sheets and income statements of Islamic commercial banks, IBUs, and non-Islamic banks are used. For non-Islamic banks, financial information was obtained from the official website of Bank Indonesia. For Islamic banks and business units, all financial statements were provided by Infobank Indonesia.

The website of Bank Indonesia does not provide separate financial information for IBUs. The financial statement figures of all IBUs form part of the financial statement figures of the non-Islamic banks that they are part of. As a result, the independent IBU financial data provided by *Infobank Indonesia* was used to make required changes to the financial statements of non-Islamic banks by separating out the IBU information. For example, PT. Bank Danamon Indonesia, Tbk (PT. BDI) is a non-Islamic bank with an IBU. The following changes were made to its 2010 total assets figure to separate the total assets of the bank and the IBU completely:

Total assets of PT. BDI	IDR 113,860,553 million
Total assets of the IBU of PT. BDI	(IDR 1,047,471 million)
Total assets of PT. BDI (as non-Islamic bank)	IDR 112,813,082 million

3.7.1 Number of employees

Bank employee figures were obtained from Infobank Indonesia, which collects its figures from the annual reports of all banks. However, the employee figures of IBUs on their own could not be provided since these were included in the total employee count of the non-Islamic banks with IBUs. An indirect calculation of the number of employees working in IBUs was conducted by using the proportional staff expenses from the income statements of the IBUs and non-Islamic banks to calculate the number of employees for each one. The assumption applied to the calculation is that the salaries of all employees in non-Islamic parent banks are similar; therefore employee numbers may be proportionally calculated based on the separate staff expenses of the non-Islamic parent banks and their IBUs. For example, the number of employees for the IBU of PT. BDI in 2010 is calculated as follows:

Employees of IBU	staff expenses of IBU x total employees of parent bank Staff expense of parent bank
Employees of IBU	IDR 37,519 million x 53,402 employees IDR 2,545,038 million
Employees of IBU	787.25 or 787 employees

The IBU of PT. BDI had 787 employees in 2010, and the number of employees of the parent bank was 53,402 - 787 = 52,615.

3.7.2 Total number of branches of banks

The number of bank branches was collected from two sources. The data for Islamic commercial banks and non-Islamic banks were provided by *Infobank Indonesia,* collected from the annual reports of banks. The total branch numbers of IBUs were obtained from the Islamic Banking Statistics of Bank Indonesia, with the exception of 2009 data. In this year, total branch numbers of IBUs were not provided by the Islamic Banking Statistics; they were provided by *Direktorat Perbankan Syariah* (the Directorate of Sharia Banking).

3.7.3 Treatment of data with zero and negative figures

In some cases the financial statement data collected for the banks contains zero and negative figures based on their financial performance. Unfortunately such zero and negative figures cannot be used in DEA as all input and output variables require positive figures exceeding zero. For this reason, all zeros have been replaced by 0.1, except for figures used in the input and output ratio variables, i.e. interest expenses/ total assets, non-interest expenses/ total assets, interest income/ total assets, and non-interest income/ total assets. For these four variables, zeros were replaced by 0.0001.

Although the figure replacement affects the accuracy of the findings of this research, it is regarded as insignificant due to very little data deviation. As Table 3.4 shows, the replacements of zeros has a minor effect on the original data. The largest deviation is 0.008585% for non-interest income/ total assets in 2004.

Table 3-4 Deviations in the data due to the replacement of zeros

	2003	2004	2005	2006	2007	2008	2009	2010
Number of employees		1.429 E-06	4.34 E-07	8.416 E-07	1.222 E-06	1.031 E-06	3.162 E-07	
Number of branches								
Personnel expenses		1.658 E-08		3.875 E-09	6.424 E-09	8.349 E-09	2.423 E-09	
Interest expenses/ TA		5.025 E-05	1.813 E-05	1.52 E-05	1.918 E-05	1.691 E-05	3.513 E-05	
Non-interest expenses/ TA								
Loans	4.861 E-10	1.905 E-10	2.979 E-10	2.599 E-10	2.029 E-10	7.74 E-11	6.877 E-11	
Total deposits	2.396 E-10	1.12 E-10	9.209 E-11		6.785 E-11			
NIBT								
Interest income/ TA								
Non-interest income/ TA		8.585 E-05	4.16 E-05	5.465 E-05	1.058 E-04			

Note: TA = Total assets

The negative Net Income Before Tax (NIBT) figures were addressed by transforming or translating the data[22], following the method described by Hadad et al. (2012). This method was applied by adding the highest negative figure in a series (in positive format) to all the figures in the series. For example, in 2010 Bank Pundi Indonesia had the lowest NIBT, of -IDR274,688 million. To address this problem, IDR274,688 million was added to all NIBT figures in 2010, making the lowest NIBT 0. As discussed previously, the 0 was replaced with 0.1. Changing figures this way retains the actual differences between the figures of the different banks, as indicated in Table 3.5 which provides an example of how the original NIBT difference between PT. Bank Negara Indonesia (Persero) TBK and PT Bank Rakyat Indonesia (Persero) TBK is changed. The original IDR 5,981,759 million NIBT difference between the two banks remains the same after the change has been conducted.

[22] Data translation is one of the alternative ways to deal with negative values in DEA, by adding a sufficient value (the absolute value of the biggest negative to the data). See Footnote 20. Ali and Seiford (1990) and Pastor (1996) define translation invariance in DEA models.

Table 3-5 Example of treatment of negative figures

BANK	NIBT (Real) (in Million Rupiah)	Difference (in Million Rupiah)	Treatment of Negative Figure (Addition) (in Million Rupiah)	NIBT (Modified) (in Million Rupiah)	Difference (in Million Rupiah)
PT. Bank Negara Indonesia (Persero), TBK	5,688,547		274,688	5,963,235	
PT Bank Rakyat Indonesia (Persero), TBK	11,670,306	5,981,759	274,688	11,944,994	5,981,759

3.8 A general structure for relevant Islamic and non-Islamic bank financial statement variables

The inputs and outputs to be used in the DEA measurement of Islamic- and non-Islamic bank stakeholder efficiency were provided in Section 3.5. Most are derived from the financial statements of banks. The literature discussed in Section 2.4 reveals that there are definite differences in the financial statements of Islamic and non-Islamic banks, due to the differences in the way that they operate. To ensure that the data used for the comparison of the two groups of banks are similar, the financial statements of the Islamic banks are restructured to follow the same format as those of non-Islamic banks.

In this study, discretionary changes were conducted based on the comparison of all relevant data items in the respective financial statements of the two bank groups, and allocation of such items thereafter to corresponding data categories of non-Islamic banks. The general financial statement structures compiled for Islamic and non-Islamic banks are reflected in Tables 3.6 to 3.8.[23]

[23] Financial reports formats for Islamic and non-Islamic banks are based on the website of Bank Indonesia (www.bi.go.id)

Table 3-6 General structure for the assets in the balance sheet of Islamic and non-Islamic banks

NON ISLAMIC BANKS	ISLAMIC BANKS	NOTES*
Cash		
Cash	Cash	
Deposits with other banks		
Placements with Bank Indonesia	Placements with Bank Indonesia	
Interbank placement		
	SBIS	*Sertifikat Bank Indonesia Syariah* (SBIS) or Bank Indonesia Sharia Certificate (SBIS): is a short-term security denominated in the rupiah issued by Bank Indonesia based on Sharia Principles.[a]
	Placements with other banks	
Loans to customers		
Loans	*Murabaha* receivables and relevant account data	*Murabaha* receivable (financing): funds owed to bank for financing of transactions equivalent to the price of the goods with the added margin defined in advance by both parties.[b]
	Salam receivables and relevant account data	*Salam* receivables: funds owed to the bank for the financing of transactions to buy goods using the order method with specified requirements and full cash payment in advance.[b]
	Istishna receivables and relevant account data	*Istishna* receivables: funds owed to bank for the financing of transactions comprising an order for the production of goods with agreed specified criteria and requirements and with payment on agreed terms.[b]
	Qardh receivables and relevant account data	*Qardh* receivables: funds owed to bank for the borrowing of funds with the obligation to repay only the loan principal by using bullet payments or the installment basis over a specified period of time.[b]
	Ijarah	*Ijarah*: funds owed to bank for leasing transactions on specific assets.[b]
Fixed assets		
Fixed assets and equipment	Fixed asset	
Accumulated depreciation on fixed assets and equipment	Accumulated depreciation of fixed assets	
Abandoned property	Foreclosed collateral	
Foreclosed assets	Non-earning assets provision	
Suspense accounts		
Inter-branch assets		
a. Conducting operational activities in Indonesia		
b. Conducting operational activities outside Indonesia		
Impairment on other assets		
Securities		
a. Measured at fair value through profit and loss	Securities	
b. Available for sale	a. Rupiah	
c. Hold to maturity	i. Holding to maturity	
d. Loan and receivables	ii. Others	

Table 3-6 General structure for the assets in the balance sheet of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANKS	ISLAMIC BANKS	NOTES*
Securities sold under repurchase agreement (repo)	Allowance for earning asset Possible losses	
Claims on securities bought und er reverse repo	b. Foreign currency	
	i. Holding to maturity	
	ii. Others	
	Allowance for earning asset Possible losses	
Spot and derivatives claims	Inventories	
Acceptance claims	Prepaid expense	
Non-earning assets provision	Advance tax	
Leasing	Asset of deffered tax	
Deferred tax assets		
Other assets		
Intangible assets	Other assets	
Accumulated amortisation of intangible assets		
Other assets		
Depreciation		

* The Notes column only defines the uncommon terms used by Islamic banks (i.e. *murabaha*). This does not mean that the accounting treatment is the same.

Sources: a) Bank Indonesia Regulation Number 10/ 11 / PBI/ 2008

b) Codification of Islamic Banking Product, Directorate of Islamic Banking Bank BI 2008

Table 3-7 General structure for the liabilities and equity of Islamic and non-Islamic banks

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
Loans from other banks		
Liabilities to Bank Indonesia	Liabilities to other banks	
Interbank liabilities		
Customer deposits		
Current account	*Wadiah* current account	*Wadiah* current accounts: goods or money custody between the owner and the entrusted party (bank) with the obligation of the entrusted party to return the goods or money at any time using cheque, other payment instruction, or by overbooking.[a]
Saving account	*Wadiah* savings account	*Wadiah* saving account: goods or money custody between the owner and the entrusted party (bank) with the obligation of the entrusted party to return the goods or money at any time based on specified requirements agreed in advance, but cannot be withdrawn using cheque and or other similar instruments.[a]
Time deposit		
Revenue sharing investment	Other current liabilities	
	Liabilities to Bank Indonesia	
	Unrestricted investment fund (Mudharaba Muthlaqah)	*Mudharaba muthlaqah*: Partnership between the fund owner and fund manager (bank) by sharing the business profit according to the contract without any restriction in type of business, tenor, and place in accordance with the requirement of fund owner.[a]
	a.*Mudharaba* savings account	*Mudharaba* saving account: saving account with *Mudharaba* contract (Partnership between the fund owner and fund manager (bank) by sharing the business profit according to the contract).[a]
	b.*Mudharaba* Time Deposits	*Mudharaba* time deposit: time deposit with *mudharaba* contract (Partnership between the fund owner and fund manager (bank) by sharing the business profit according to the contract).[a]
Other debt loans		
Loans received	Securities issued	
	Loan/ financing received	
	a. Rupiah	
	i. Related with bank	
	ii. Not related with bank	
	b. Foreign Currency	
	i. Related with bank	
	ii. Not related with bank	
	Estimated losses on commitment and contingencies	
Other liabilities		
Spot and derivatives liabilities	Accrued expense	
Liabilities on securities sold under repurchase agreement	Estimated income tax	

Table 3-7 General structure for the liabilities and equity of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
Acceptance liabilities	Deferred tax liabilities	
Issued securities	Others liabilities	
Margin deposit	Subordinated loan	
Inter-branch liabilities	a. Rupiah	
a. Conducting operational activities in Indonesia	i. Related with bank	
b. Conducting operational activities outside Indonesia	ii. Not related with bank	
Deferred tax liabilities	b. Foreign Currency	
Provision on commitment and contingencies	i. Related with bank	
Other liabilities	ii. Not related with bank	
Profit Sharing investment	Others liabilities	
	Loan capital	
Share capital		
Loaned capital	Equity	
Paid in capital	Paid up capital	
a. Capital	- Agio(disagio)	
b. Unpaid capital	- Donated capital	
c. treasury stock	- Funds for paid up capital	
Additional paid in capital	Translation adjustment in financial statement	
a. Agio	- Increase(decrease) on available for sale portfolio value	Agio is the difference between the market value and the par value of the stock, where the market value is higher than the par value.[b]
b. Disagio		Disagio is the difference between the market value and the par value of the stock, where the market value is lower than the par value.[b]
c. Donated capital		
d. Translation adjustment		
e. Other comprehensive gain (loss)		
f. Others		
g. Fund for paid up capital		
Reserve		
Reserves of fixed asset revaluation	Reserves for revaluation of fixed assets	
Reserves of quaty reorganisation		
Reserves of restructuring under common control		
Reserves		
a. General reserves		
b. Appropriated reserves		

Table 3-7 General structure for the liabilities and equity of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
Accounting profit		
Gain/ loss	Balance of profit (Loss)	
a. Previous years		
b. Current year		

* The Notes column only defines the uncommon terms used by Islamic banks (i.e. *murabaha* etc.). It does not mean that the accounting treatment is the same.

Sources: a) Codification of Islamic Banking Product, Directorate of Islamic Banking Bank BI 2008

b) http:/ / www.investopedia.com

Table 3-8 General structure for the income statements of Islamic and non-Islamic banks

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
Interest income		
1. Interest income	Income from fund disbursement	
	1.From third party non-Bank	
	a. *Murabaha* margin income	*Murabaha*: buying and selling specified goods with value equivalent to the price of the goods plus a margin defined in advance by both parties. Seller provides information on the price of the goods in advance to the buyer.[a]
	b. Parallel *Salam* net income	*Salam*: buying and selling goods using order method with specified requirements and full cash payment in advance.[a] Parallel *salam*: a back-to-back contract, where the seller sells goods with the same specification as the purchased goods under a *salam* contract to the other party.[b]
	c. Parallel *Istishna* net income	*Istishna*: Buying and selling transaction comprising an order for the production of goods with agreed specified criteria and requirements, and with payment on agreed terms.[a] Parallel *istishna*:the seller has the option to manufacture or build the goods or to order the goods from other party.[b]
	i. *Istishna* income	
	ii. Cost of *Istishna*	
	d. *Ijarah* leased income	*Ijarah* leased income: leasing transaction on specified goods and/ or services between the owner of the leased object (including the right of use on leased object) and the lessee, in order to earn a fee on the object leased.[a]
	e. *Mudharaba* revenue sharing income	*Mudhraba:* partnership between the fund owner and fund manager (bank) sharing the business profit according to a contract.[a]
	f. *Musyarakah* revenue sharing income	*Musyarakah*: transaction of investment from two or more fund and/ or goods owners to conduct a specified business activity in compliance with *sharia* principles, with a division of profit between those parties based on a ratio agreed in advance, while division of loss will be based on the capital proportion of each party.[a]
	g. Income from Equity participation	
	h. Others	
	2. From Bank Indonesia	
	a. Bank Indonesia *Wadiah* Certificate (SBIS) Bonuses	
	b. Others	
	3. From others bank in Indonesia	
	a. Bonuses from other *sharia* bank	

Table 3-8 General structure for the income statements of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
	b. *Mudharaba* revenue sharing income	*Mudharaba*:partnership between the fund owner and fund manager (bank), sharing the business profit according to a contract.[a]
	i. *Mudharaba* savings account	
	ii. *Mudharaba* time deposits	
	iii. M*udharaba* Interbank Investment Certificate	
	iv. Others	
	c. Others	
Interest expense		
	Wadiah consignment bonus expenses	*Wadiah*: goods or money custody between the owner and the entrusted party (bank).[a]
	Revenue sharing distributed for investor of unrestricted investment fund	
	1. Third parties non-bank	
	a. *Mudharaba* saving accounts	
	b. *Mudharaba* Time deposits	
	c. Others	
	2.Bank Indonesia	
	a. Sharia short term funding facility	
	b.Others	
	3. Other banks in and outside Indonesia	
	a. *Mudharaba* saving account	
	b. *Mudharaba* time deposits	
	c. *Mudharaba* Interbank Investment certificate	
	d. Others	
Net interest income	Net interest income	
Net interest income (expenses)	Operating Income after revenue sharing distributed to investors in unrestricted investment funds	
Other operating income		
1. Operational Income Other than Interest	1. Restricted investment fees (Mudharaba Muqayyadah)	
a. Positive mark to market o n financial assets	2. Services fee	
i. Securities	3. Foreign exchange transaction income	
ii. Loans	4. Correction of allowance for earning asset possible losses	
iii. Spot and derivatives	5. Correction of allowance for administrative account possible losses (PPAP)	
iv. Other financial assets	6. Others	

Table 3-8 General structure for the income statements of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
b. Negative mark to market on financial liabilities	Non-operating income	
c. Gain on sale of financial assets		
i. Securities		
ii. Loans		
iii. Other financial assets		
d. Gain on spot and derivatives (realised)		
e. Dividend, gain on investment under equity method, comission/ provision fee and administration		
f. Reversal of impairment, non-earning assets provision, and provision on commitments and contingencies		
g. Other income		
Other operating expenses		
Operating expenses other than interest expenses	Operating Expenses Other than Interest expenses	
a. Negative mark to market on financial assets	Expense (income) for estimated losses from commitments and contingencies	
i. Securities	Other operating expenses	
ii. Loans	General and administration Expenses	
iii. Spot and derivatives	Salaries and employee benefits	
iv. Other financial assets	Securities value reduction expenses	
b. Positive mark to market on financial liabilities	Foreign exchange transaction expenses	
c. Loss on sale of financial assets	Promotion expenses	
i. Securities	Other expenses	
ii. Loans		
iii. Other financial assets		
d. Loss on spot and derivatives (realised)		
e. Impairment of financial assets		
i. Securities		
ii. Loans		

Table 3-8 General structure for the income statements of Islamic and non-Islamic banks (continued)

NON ISLAMIC BANK	ISLAMIC BANK	NOTES*
iii. Sharia financing		
iv. Other financial assets		
f. Provision of expenses for commitments and contingencies		
g. Provision of expenses for operational risk		
h. Losses on operational risk		
i. Losses on investment under equity method, commission/ provision fee, and administration		
j. Impairment of other assets (non-financial)		
k. Provision of expenses from non-earning assets		
l. Personnel expenses		
m. Promotion expenses		
n. Other expenses		
Non-operating income/ expenses		
Gain (loss) on sale of fixed a ssets and equipment	Non-operating expense	
Gain (loss) on foreign Excha nge translation		
Other non-operational income (expenses)		
NIBT		
Current year profit (loss)	Current year profit (loss	
Transfer of profit (loss) to head office		
Tax		
Income tax	Estimated income tax	
Estimated current year tax		
Deferred tax income (expenses)		
NIAT		
Net profit (loss)	Profit (Loss)	

* This column (notes) only defines the uncommon terms used by Islamic banks (i.e. *murabaha* etc.). It does not mean that the accounting treatment is the same.

Sources: a) Codification of Islamic Banking Product, Directorate of Islamic Banking Bank BI 2008

b) http:/ / zouine-anass.blog4ever.com

The interest income of Islamic banks, IBUs and non-Islamic banks is matched by using the profit/ loss sharing and the margin income resulting from the mark-up of Islamic banks and IBUs as equivalent to the interest income of non-Islamic banks. Based on the restructured matching financial statements, the data used as the required inputs and outputs for the DEA efficiency measurements are reflected in Table 3.9.

A fair comparison between the stakeholder efficiency of the different bank types can be based on the general restructured financial statements of Islamic banks, IBUs and non-Islamic banks.

Table 3-9 Data in the restructured financial statements used for the DEA input and output variables

NON-ISLAMIC BANKS	ISLAMIC BANKS	ISLAMIC BUSINESS UNITS
Interest income		
Interest income	Income from fund disbursement	Margin income
	Wadiah consignment bonus expenses	Revenue sharing income
		Bonuses
Income other than interest		
Operating income other than interest expenses	Other operating income	Other operating income
	Income of provision for asset possible losses	
	Income for estimated losses of commitment and contingencies	
Non-operating profit	Non-operating income	Non-operating income
Interest expense		
Interest expenses	Revenue sharing distributed to investors of unrestricted investment funds	Interest expenses
Expenses other than interest		
Operating expenses other than interest expenses	Others operating expenses	Other operating expense
	Expense of provision for asset possible losses	
	Expense for estimated losses of commitments and contingencies	
Non-operating loss	Non-operating expenses	Non-operating expenses
Personnel expenses		
Personnel expenses	Personnel expenses	Personnel expenses
Loans		
Loans	*Murabaha* receivables	*Sharia* financing (from parent bank)
	Salam receivables	
	Istishna receivables	
	Qardh receivables	
	Financing	
	Ijarah	
Total deposits		
Current account	*Wadiah* fund	*Wadiah* fund
Saving accounts	Unrestricted investment funds (*Mudharaba Muthlaqah*)	Unrestricted investment funds (*Mudharaba Muthlaqah*)
Time deposits		
Revenue sharing Investments		
NIBT		
Current year profit (loss)	Profit (loss)	Profit (loss)
Total assets		
Total assets	Total assets	Total assets

Sources: a) Financial report formats for Islamic and non-Islamic banks are based on the website of Bank Indonesia (www.bi.go.id)

b) Financial report formats for IBUs is based on 2010 publish financial reports

3.9 Applying DEA efficiency measurement to compare the stakeholder efficiency of Islamic and non-Islamic banks

Efficiency of the Islamic and non-Islamic banks is measured using Data Envelopment Analysis (DEA). DEA is a non-parametric linear programming approach in frontier estimation, suggested by Charnes, Cooper and Rhodes (1978). Coelli (1996) mentions that DEA is based on the work of Farrell (1957). According to Farrell (1957), the total economic efficiency of a firm, in this case a bank, consists of technical and allocative efficiency. A bank is technically efficient if it can produce maximum outputs from given inputs, while allocative efficiency reflects its ability to optimise the inputs, given the outputs.

DEA measures the technical efficiency of a bank relative to 'best practice' bank(s) on the frontier. Instead of traditional efficiency measurement methods that use a single input and a single output, DEA can incorporate multiple inputs and outputs. Cronje and Mutezo (2000) mention that DEA is a prominent approach in measuring banking efficiency.

The original model proposed by Charnes, Cooper and Rhodes (1978) assumes a CRS with input orientation. Based on the model, assume that there are K inputs and M outputs for each of N banks. The i^{th} bank is represented by column vectors x_i and y_i. The data of all banks are represented by the K x N input matrix, X, and the M x N output matrix, Y. The objective of a DEA model is to construct a non-parametric envelopment frontier, where the entire observed points lie on or below the frontier. The envelopment form of the input-orientated CRS model can be derived as follows:

$$\min_{\theta,\lambda} \theta \qquad (3.1)$$
$$\text{subject to } -y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0,$$
$$\lambda \geq 0.$$

θ is a scalar with value between 0 and 1. λ is a N x 1 vector of constants. The value of θ reflects the CRS efficiency score of the i^{th} bank. The value of 1 indicates a point on the frontier implying that the bank is technically efficient. With the input

orientation CRS model, a bank is technically efficient if the inputs cannot be proportionally reduced to produce the same amount of outputs.

The input-orientated DEA model can be used to focus on input minimisation to produce a given output, while the output-orientated DEA model is applied to focus on output maximisation for given inputs. For the output-orientated CRS model, Equation 3.1 is simply modified as follows:

$$\max_{\varphi,\lambda} \varphi \qquad (3.2)$$
$$\text{subject to } -\varphi y_i + Y\lambda \geq 0,$$
$$x_i - X\lambda \geq 0,$$
$$\lambda \geq 0.$$

Analogous with θ, φ reflects technical efficiency of the i^{th} bank. With this model, a bank is technically efficient if the outputs cannot be proportionally increased given the same inputs.

As previously stated, Equation 3.1 assumes CRS, which is only applicable when all banks operate at their most optimal scale. Imperfect competition and other factors may cause a bank not to operate at its optimal scale (Coelli, 1996). Banker, Charnes and Cooper (1984) propose an important extension of the CRS DEA model to accommodate variable returns to scale (VRS). The VRS model (also known as the BCC model after its designers) enables the measurement of the pure technical efficiency without the effect of scale inefficiency. For the input-orientated VRS calculation the convexity constraint, $N1'\lambda=1$ is added to Equation 3.1:

$$\min_{\theta,\lambda} \theta \qquad (3.3)$$
$$\text{subject to } -y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0,$$
$$N1'\lambda = 1$$
$$\lambda \geq 0.s$$

N1 is a N x 1 vector of ones. Like the CRS model, θ reflects the VRS efficiency score of the i^{th} bank. The value of 1 indicates full efficiency and lies on the frontier. The VRS model provides a pure technical efficiency score, which is higher than or equal to the CRS score (technical efficiency score).

Like the CRS model, the input-orientated VRS model is modified as follows to provide the output-orientated VRS model:

$$\max_{\varphi,\lambda} \varphi \qquad (3.4)$$
$$\text{subject to } -\varphi y_i + Y\lambda \geq 0,$$
$$x_i - X\lambda \geq 0,$$
$$N1'\lambda = 1$$
$$\lambda \geq 0.$$

The value of φ reflects the VRS efficiency score of the i^{th} bank. A bank is fully efficient based on the output-orientated VRS model if it is not possible to proportionally increase the outputs without additional inputs.

In reality, a bank can operate at increasing or decreasing returns to scale. This may be determined by running an addition DEA problem with non-increasing returns to scale (NIRS). The increasing returns to scale (IRS) and decreasing returns to scale (DRS) can be identified by substituting restriction $N1'\lambda = 1$ with $N1'\lambda \leq 1$ in Equation 3.3 to provide:

$$\min_{\theta,\lambda} \theta \qquad (3.5)$$
$$\text{subject to } -y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0,$$
$$N1'\lambda \leq 1$$
$$\lambda \geq 0.$$

Analogously, Equation 3.4 can be modified to form an output-orientated NIRS DEA mathematical problem:

$$\max_{\varphi,\lambda} \varphi \qquad (3.6)$$
$$\text{subject to } -\varphi y_i + Y\lambda \geq 0,$$
$$x_i - X\lambda \geq 0,$$
$$N1'\lambda \leq 1$$
$$\lambda \geq 0$$

If the CRS score equals the VRS score, it means that the bank operates on its most efficient scale or optimum returns to scale (ORS). If the VRS score of a bank is not

equal to the NIRS score, it implies that the bank operates under IRS. In contrast, if the VRS score is equal to the NIRS score, it means that the bank operates under DRS.

3.9.1 Application of annual frontier DEA

Based on the DEA model, the annual DEA stakeholder efficiency measurements are conducted for all banks from 2003 to 2010 (detailed results are provided in Section 4.3). In this study, both CRS and VRS approaches are applied. The output-orientated DEA model is used because the objective of the research is to compare the outputs (stakeholder support/ satisfaction) achieved given the inputs applied; thus, the outputs serve as criteria of efficiency.

In the annual frontier DEA, the DEA stakeholder efficiency of Islamic and non-Islamic bank groups is measured for each year from 2003 to 2010. The different stakeholder efficiency results of the banks are compared year by year. The results explain the relative CRS and VRS efficiency of each bank group for each of the stakeholder categories.

3.9.2 Single multiyear-frontier DEA

The efficiency measurement of all banks for all years (2003 to 2010) is constructed using a single multiyear-frontier. By incorporating this method, the relative efficiency changes of banks across time can be observed. This approach is also taken by Cullinane (2005) and Miniaoui and Tchantchane (2010). The efficiency scores obtained from the single multiyear-frontier approach is incorporated in the regression analysis, and a detailed discussion of this appears in Section 3.10.[24]

3.10 Statistical tests for DEA results

The Kolmogorov–Smirnov test is applied to test the normality of the DEA results. This test is important to determine which statistical test is appropriate for the data.

[24] Malmquist Productivity Index (MPI) cannot be applied because of the unbalanced panel data.

The DEA results in Chapter 4 are not normally distributed; therefore, the application of a non-parametric test is appropriate and the Mann–Whitney test is conducted to compare Islamic and non-Islamic bank groups. This is a non-parametric test for two independent samples with a null hypothesis that the medians of two groups are the same (Siegel & Castellan, 1988). A p-value ≤ 0.05 is applied as benchmark for this test. The Mann–Whitney test has previously been used by Ahmad and Rahman (2012), Bader et al. (2008), Hassan et al. (2009), and Ika and Abdullah (2011) to compare the efficiency of Islamic and non-Islamic bank groups.

3.11 Regression analysis

To determine whether the differences between the CRS and VRS efficiency scores of Islamic and non-Islamic banks have influenced the growth differences between the banks, the scores obtained from the single multiyear-frontier DEA method are used as independent variables in a regression analysis where the dependent variable is the change in total assets for each bank. In this approach, DEA is used as a data reduction/ data summary technique whereby a number of different variables are encapsulated in a single score. Two regression models are applied. First, the impact of changes in efficiency scores on the changes in total assets is determined by applying the following formula:

$$\Delta TA_{i,t} = \alpha + \beta_1 \Delta CC_{i,t} + \beta_2 \Delta EM_{i,t} + \beta_3 \Delta SH_{i,t} + \varepsilon \quad (3.7)$$

where:

$\Delta TA_{i,t}$ = Change in total assets of bank i from year t-1 to year t

α = Constant

β = Multiple regression coefficient

$\Delta CC_{i,t}$ = Change in efficiency score of Customer–Community for bank i from year t-1 to year t

$\Delta EM_{i,t}$ = Change in efficiency score of Employee for bank i from year t-1 to year t

$\Delta SH_{i,t}$ = Change in efficiency score of Shareholder for bank i from year t-1 to year t

ε = Error term

The regression is based on an unbalanced panel (Greene, 2003) since there are multi-year observations of the same bank but not all banks appear in the dataset in all years. Standard errors associated with the estimates of the coefficients α, β_1, β_2 and β_3 are adjusted for heteroscedasticity to permit valid inferences about them when the assumption of homoscedasticity is violated. Equation 3.7 is estimated separately for Islamic and non-Islamic banks to facilitate comparison of different sensitivities to the DEA scores which might exist between the two types of banks.

Second, the actual variables summarised by the DEA scores are used to delve deeper into any relationships that the estimation of Equation 3.7 uncovers. The second model is:

$$\Delta TA_{,i,t} = \alpha + \beta_1\Delta(\text{Total Loans})_{i,t} + \beta_2\,\Delta(\text{Deposits})_{i,t} + \beta_3\,\Delta(\text{NIBT})_{i,t} + \beta_4\,\Delta(\text{Int\_Inc})_{i,t} + \beta_5\Delta(\text{Non-Int\_Inc})_{i,t} + \beta_6\Delta(\text{Branches})_{i,t} + \beta_7\Delta(\text{Emp})_{i,t} + \beta_8\Delta(\text{Pers\_Exp})_{i,t} + \beta_9\Delta(\text{Int\_Exp})_{i,t} + \beta_{10}\Delta(\text{Non-Int\_Exp})_{i,t} + \varepsilon \quad (3.8)$$

where:

$\Delta TA_{i,t}$ = Change in total assets of bank i from year t-1 to year t

α = Constant

β = Multiple regression coefficient

ΔTotal $\text{Loans}_{i,t}$ = Change in total loan for bank i from year t-1 to year t

Δ $\text{Deposits}_{i,t}$ = Change in total deposit for bank i from year t-1 to year t

$\Delta NIBT_{,i,t}$ = Change in NIBT for bank i from year t-1 to year t

$\Delta\text{Int\_ Iinc}_{i,t}$ = Change in interest income for bank i from year t-1 to year t

$\Delta\text{Non-Int\_Inc}_{i,t}$ = Change in non-interest income for bank i from year t-1 to year t

$\Delta\text{Branches}_{i,t}$ = Change in number of branches for bank i from year t-1 to year t

$\Delta\text{Emp}_{,i,t}$ = Change in number of employees for bank i from year t- to year t 1

$\Delta\text{Pers\_Exp}_{i,t}$ = Change in personnel expense for bank i from year t-1 to year t

$\Delta\text{Int\_Exp}_{i,t}$ = Change in interest expense for bank i from year t-1 to year t

$\Delta\text{Non-Int\_Exp}_{i,t}$ = Change in non-interest expense for bank i from year t-1 to year t

ε = Error term

For Equation 3.8, the same procedure is followed as in Equation 3.7. However, the number of variables that are used raise the question whether a more parsimonious model might be found for the dependent variable. Therefore, in addition to applying Equation 3.8 using all the potential explanatory variables, a stepwise procedure is used whereby the coefficient with the highest *p*-value (that is, the coefficient least likely to have a role in the model) is deleted until the Akaike Information Criterion (AIC) (Akaike, 1973) reaches its minimum value for the equation.

3.12 Summary

This research applies a new approach to measure the comparative efficiency of banks with the well-known DEA model by using input and output variables based on different stakeholder efficiencies. The efficiency measurement is conducted for four stakeholders: Customers, the Community, Employees, and Shareholders. For each stakeholder, the appropriate input and output variables are assigned. Since most of the variables are contained in the financial statements of banks, differences in the structure or content of the financial statements of Islamic and non-Islamic banks is addressed by aligning the structures for the assets, liabilities, income and expenses to provide similar, comparable figures. The research also applies an acknowledged method of treating negative figures in order to apply DEA to such figures. The Kolmogorov–Smirnov test is applied to test the normality of the DEA results, followed by the appropriate tests to determine the significance of the findings.

The DEA analysis is augmented by regression analysis to determine whether the differences between the efficiency scores of Islamic and non-Islamic banks have influenced the growth differences between the banks. The findings of the research are contained in the next chapter.

Chapter 4

FINDINGS ABOUT THE COMPARATIVE EFFICIENCY OF ISLAMIC AND NON-ISLAMIC BANKS

4.1 Introduction

The focus of the first part of this chapter is to provide an overview of the DEA findings regarding the comparative stakeholder efficiency of Islamic and non-Islamic banks, followed by the details of annual findings for the total period 2003–2010, to which the research applies. Regression analysis is conducted to observe whether differences between the efficiency of Islamic and non-Islamic banks influence changes in total assets (that is, the growth of the banks).

4.2 DEA findings: overview

A summary of the findings about the comparative efficiency of Islamic and non-Islamic banks appears in Table 4.1. Efficiency was measured using both Constant Return to Scale (CRS) and Variable Return to Scale (VRS) DEA models. The efficiency scores of the Islamic and non-Islamic banks are compared, and the significance of such differences determined by using the Mann–Whitney test, since efficiency scores of banks show non-parametric distribution in all years of comparison. A *p*-value of 0.05 was used as benchmark for statistical significance.

Table 4-1 Summarised comparative efficiency of Islamic and non-Islamic banks, 2003–2010

Stakeholder		2003	2004	2005	2006	2007	2008	2009	2010
Customers–Community	**CRS**				-				
	VRS		-	-	-	-		-	
Employees	**CRS**			-					+
	VRS		+				+	+	
Shareholders	**CRS**		-				-		
	VRS			-	-		-	-	-
Overall	**CRS**							+	
	VRS						+		-

Note: (+): The average median efficiency score of Islamic banks is statistically significant higher than that of the non-Islamic banks

(-): The average median efficiency score of non-Islamic banks is statistically significant higher than that of the Islamic banks

The differences between the CRS efficiency of the Islamic and non-Islamic banks for the different stakeholders only exist in certain years. Significant differences for any group of stakeholders do not occur more than two times over the total period of time, and never occur subsequently. The significant efficiency differences for the various stakeholders do not apply in the same years. As a result it is clear that CRS differences are neither consistent nor prevalent.

The VRS efficiency differences between the Islamic and non-Islamic banks are very pertinent and apply to both Customer–Community and Shareholder efficiency. In this regard the efficiency of non-Islamic banks exceeded the Customer–Community efficiency of Islamic banks from 2004 to 2007, and again in 2009. The shareholder efficiency of non-Islamic banks was also better than that of the Islamic banks in 2005 and 2006, and again from 2009 to 2010. However, the employee efficiency of the Islamic banks exceeded that of non-Islamic banks in 2004, 2008 and 2009.

From a total perspective it is obvious that there are no consistent differences in the existing stakeholder efficiencies of Islamic and non-Islamic banks in terms of CRS DEA analysis. However, analysis of the efficiency differences that may exist

between the two groups of banks when allowing for the economies and diseconomies of scale (application of VRS DEA), shows that the pure technical efficiency of non-Islamic banks exceeds that of Islamic banks. The analysis of the percentage of banks that operate at an increasing scale of efficiency, an optimal scale of efficiency, and a decreasing scale of efficiency indicates that, notwithstanding the higher pure technical efficiency of the non-Islamic banks, with regard to Customer–Community efficiency and Shareholder efficiency, more Islamic banks are operating at increasing scale of operations and optimal scale of operations than non-Islamic banks. This also applies to Employee efficiency (Tables 4.7, 4.11, 4.15, 4.19, 4.23, 4.27, and 4.31).

The detailed year-to-year efficiency analysis that has been conducted to provide the summarised findings is provided in the ensuing sections of this chapter.

4.3 Year-to-year DEA efficiency comparison of Islamic and non-Islamic banks

The DEA comparative year-to year findings in the ensuing sections highlight important changes or tendencies in the input and output variables of Islamic and non-Islamic banks, the CRS and VRS DEA efficiency core statistics of each stakeholder category for each of the bank types, normality of distribution of the efficiency scores, and the significance of differences in the DEA scores.

4.3.1 Findings for 2003

Table 4.2 contains the summary statistics of the input and output variables used for the comparison of the Islamic and non-Islamic banks for the 2003 calendar year. It is evident from the information contained in the table that the total loans, total deposits, number of employees, number of branches, and net income before tax (NIBT) of the non-Islamic banks exceed those of the Islamic banks substantially:

- The average total loans of non-Islamic banks exceed those of Islamic banks by more than 633% (IDR3,865,768 million vs IDR610,526 million).
- The average total deposits of non-Islamic banks exceed those of the Islamic banks by 1,193% (IDR7,894,673 million vs IDR661,995 million).
- On average, non-Islamic banks have 6.0 times more employees than Islamic banks (1,766 employees vs 294 employees).

- The average number of non-Islamic bank branches is 3.39 times more than that of Islamic banks (112 branches vs 33 branches).
- The average IDR217,870 million NIBT of non-Islamic banks is higher than the IDR7,669 million of Islamic banks.

Table 4-2 Descriptive statistics of inputs and outputs for 2003

Bank	Mean	Median	Std. Dev.	Maximum	Minimum	Interquartile
Loans (in million IDR)						
Non-Islamic	3,865,768	699,227	10,178,870	73,442,941	0	2,472,057
Islamic	610,526	118,685	948,478	2,363,682	31,129	1,261,922
Total Deposits (in million IDR)						
Non-Islamic	7,894,673	954,226	24,245,432	177,252,730	0	3,020,874
Islamic	661,995	100,190	1,087,363	2,628,887	34,000	1,408,125
NIBT (in million IDR)						
Non-Islamic	217,870	33,544	772,544	6,373,336	-328,197	134,835
Islamic	7,669	1,298	16,460	34,495	-8,668	32,029
Interest income/ Total assets						
Non-Islamic	0.1145	0.1138	0.0387	0.2454	0.0097	0.0495
Islamic	0.0792	0.0835	0.0424	0.1641	0.0228	0.0593
Income other than interest/ Total assets						
Non-Islamic	0.0160	0.0097	0.0194	0.1178	0.0017	0.0108
Islamic	0.0070	0.0070	0.0046	0.0155	0.0013	0.0072
Employees						
Non-Islamic	1,766	290	4,800	34,672	9	653
Islamic	294	47	470	1,372	10	479
Branches						
Non-Islamic	112	14	463	4,544	1	45
Islamic	33	11	54	157	2	51
Personnel expenses (in million IDR)						
Non-Islamic	137,151	17,705	451,170	3,777,908	1,256	65,935
Islamic	14,861	5,139	21,297	59,296	756	25,191
Interest expenses/ Total assets						
Non-Islamic	0.0560	0.0572	0.0244	0.1076	0	0.0332
Islamic	0.0323	0.0313	0.0224	0.0753	0.0058	0.0370
Expenses other than interest/ Total assets						
Non-Islamic	0.0188	0.0125	0.0205	0.1537	0.0014	0.0129
Islamic	0.0572	0.0486	0.0204	0.0973	0.0389	0.0288

Note: Number of Islamic banks = 9 banks;
Number of non-Islamic banks = 105 banks

The income and expense ratios of the banks in Table 4.2 are stated relative to their total assets to eliminate the effect of size differences. In this regard the relative performance ratios provide the following information:

- The non-Islamic banks show a higher average interest income/ total asset ratio of 11.45%, compared to the 7.92% of Islamic banks.
- The non-Islamic banks have a higher average non-interest income/ total asset ratio of 1.6% compared to the 0.7% of the Islamic banks.
- Islamic banks have a lower average interest expense/ total asset ratio of 3.23%, compared to the 5.6% of non-Islamic banks.
- Islamic banks have a higher average non-interest expense/ total assets ratio of 5.72% compared to the 1.88% of non-Islamic banks.

Table 4-3 Descriptive statistics of DEA results for 2003

Bank	Mean	Median	Std. Dev	Max	Min	Inter-quartile	IRS **	DRS ***	ORS ****
CRS - Customer–Community									
Non-Islamic	0.1947	0.1010	0.2375	1.0000	0.0060	0.1525			
Islamic	0.0933	0.0800	0.0328	0.1340	0.0400	0.0575			
CRS – Employee									
Non-Islamic	0.4760	0.4410	0.2397	1.0000	0.1170	0.3355			
Islamic	0.4724	0.4510	0.2475	1.0000	0.2090	0.3255			
CRS – Shareholder									
Non-Islamic	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *			
Islamic	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *			
CRS – Overall									
Non-Islamic	0.8328	0.8580	0.1525	1.0000	0.5260	0.3020			
Islamic	0.6758	0.5200	0.2632	1.0000	0.3990	0.5505			
VRS - Customer–Community									
Non-Islamic	0.3223	0.1920	0.3129	1.0000	0.0060	0.4965	29%	64%	8%
Islamic	0.2497	0.1620	0.2965	1.0000	0.0410	0.2065	67%	33%	0%
VRS – Employee									
Non-Islamic	0.7252	0.7210	0.1765	1.0000	0.3520	0.2550	2%	91%	7%
Islamic	0.7608	0.7330	0.1709	1.0000	0.4640	0.2600	0%	89%	11%
VRS – Shareholder									
Non-Islamic	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
Islamic	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *	N/A *
VRS – Overall									
Non-Islamic	0.9248	0.9690	0.0961	1.0000	0.5500	0.1290	3%	65%	32%
Islamic	0.8257	0.8050	0.1586	1.0000	0.5680	0.2985	0%	67%	3%

Notes * No satisfactory solutions for the DEA measurement

** IRS: Increasing Returns to Scale

*** DRS: Decreasing Returns to Scale

**** ORS: Optimum Return to Scale

Table 4.3 presents the summary of the Customer–Community and Employee efficiencies of the Islamic and non-Islamic banks in 2003. In this particular year, the

DEA results for Shareholder CRS and VRS DEA efficiency could not be calculated because there are no satisfying solutions from the linear programming of the DEA efficiency. The CRS efficiency analysis shows that:

- The average Customer–Community efficiency of non-Islamic banks is higher than that of Islamic banks although the mean of both bank types is very low (0.1947 and 0.0933).
- The employee efficiency of both bank types is very equivalent.
- The overall efficiency of non-Islamic banks is better than that of Islamic banks.

The VRS scores show that the Customer–Community and Overall efficiency of non-Islamic banks exceed those of Islamic banks.

Table 4.4 contains the results for the normality of the DEA efficiency scores. Since non-normal distribution is evident, the Mann–Whitney test is applied (Table 4.5) to verify the significance of the differences in the efficiency of the two bank types.

Table 4-4 Kolmogorov–Smirnov test of normality for 2003 DEA results

INPUT – OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.25	**0.00**	0.21	0.20
Customer–Community VRS	0.19	**0.00**	0.29	**0.03**
Employee CRS	0.10	**0.01**	0.18	0.20
Employee VRS	0.08	0.10	0.18	0.20
Overall CRS	0.16	**0.00**	0.28	**0.04**
Overall VRS	0.22	**0.00**	0.20	0.20

The results of the Mann–Whitney test based, on a *p*-value of 0.05 as benchmark, show that there are no statistically significant differences in the efficiency between Islamic and non-Islamic banks for any of the stakeholders in 2003.

Table 4-5 Mann–Whitney test for 2003 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.38	0.70	-0.35	0.72
Employee	Non-Islamic banks/ Islamic banks	-0.04	0.97	-0.62	0.54
Shareholder	Non-Islamic banks/ Islamic banks	N/A *	N/A *	N/A *	N/A *
Overall	Non-Islamic banks/ Islamic banks	-1.77	0.08	-1.73	0.08

4.3.2 Findings for 2004

Table 4.6 contains the descriptive input and output variables for the DEA efficiency comparison of the Islamic and non-Islamic banks, and reflects significant differences that occurred after 2003. The most prominent difference is that the average size of non-Islamic banks increased, while the average size of Islamic banks decreased. This means that the significant size differences already identified in 2003 data have increased. In fact, non-Islamic banks show increases in average loans, total deposits, number of employees and number of branches, while Islamic banks show decreases in all of these figures. These changes occurred amidst a 100% increase in the number of Islamic banks (from 9 to 18) and a decrease in the number of non-Islamic banks from 105 to 99. Scrutiny of the input and output figures of the individual banks indicate that the changes in input and output mainly resulted from this, as the additional nine new Islamic banks are all smaller than the original nine whose figures were used in the 2003 analysis. In the case of non-Islamic banks, actual increases in size occurred.

Both bank types experienced a decrease in interest income and expense ratios and higher levels of non-interest income and expense ratios with ultimately higher NIBT figures. Islamic banks seem to have achieved the best bottom line figures, notwithstanding their size decrease.

Table 4-6 Descriptive statistics of inputs and outputs for 2004

Bank	Mean	Median	Std. Dev	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	5,176,150	896,696	13,070,895	88,544,603	8,896	3,516,054
Islamic	433,724	17,623	1,269,815	5,310,868	0	257,435
Total Deposits (in Million IDR)						
Non-Islamic	8,853,851	1,286,756	25,184,203	169,994,388	4,805	3,948,220
Islamic	442,651	29,623	1,374,357	5,725,006	0	149,164
NIBT (in Million IDR)						
Non-Islamic	362,919	43,627	1,091,265	7,429,698	-223,988	163,915
Islamic	8,807	5	38,426	150,421	-30,648	6,405
Interest Income/ Total Assets						
Non-Islamic	0.0960	0.0923	0.0360	0.1986	0.0148	0.0456
Islamic	0.0575	0.0452	0.0580	0.1886	0.0001	0.0858
Income other than interest/ Total Assets						
Non-Islamic	0.0214	0.0108	0.0429	0.3544	0.0011	0.0123
Islamic	0.0113	0.0098	0.0109	0.0454	0.0001	0.0110
Employees						
Non-Islamic	2,072	428	5,465	35,412	26	836
Islamic	164	23	457	1,913	0	105
Branches						
Non-Islamic	126	19	481	4,560	1	57
Islamic	13	3	32	134	2	7
Personnel Expenses (in Million IDR)						
Non-Islamic	179,377	26,334	515,843	3,706,770	1,602	85,539
Islamic	9,046	2,121	19,854	83,946	0	10,178
Interest Expenses/ Total Assets						
Non-Islamic	0.0359	0.0354	0.0149	0.0735	0.0004	0.0201
Islamic	0.0230	0.0050	0.0276	0.0973	0.0001	0.0394
Expenses other than interest/ Total Assets						
Non-Islamic	0.0536	0.0468	0.0378	0.2827	0.0068	0.0308
Islamic	0.1359	0.0547	0.2892	1.2413	0.0015	0.0712

Note: Number of Islamic banks = 18 banks,
Number of non-Islamic banks = 99 banks

The average CRS DEA scores for Customer–Community and Overall efficiency displayed in Table 4.7 show non-Islamic banks score higher than Islamic banks – as in 2003. The CRS Shareholder efficiency score of non-Islamic banks, calculated for

the first time in 2004 (non-calculable for 2003), is also better than that of the Islamic banks.

The average VRS Customer–Community and Shareholder efficiency scores of non-Islamic banks exceed those of Islamic banks, although Islamic banks have higher average employee and Overall VRS efficiency scores.

Table 4-7 Descriptive statistics of DEA results for 2004

Bank	Mean	Median	Std. Dev	Max	Min	Inter-quartile	IRS*	DRS **	ORS ***
CRS – Customer–Community									
Non-Islamic	0.2219	0.1085	0.2626	1.0000	0.0090	0.1603			
Islamic	0.1770	0.0800	0.2386	1.0000	0.0200	0.1335			
CRS – Employee									
Non-Islamic	0.1082	0.0525	0.1405	1.0000	0.0070	0.0818			
Islamic	0.2293	0.0780	0.3696	1.0000	0.0080	0.0995			
CRS – Shareholder									
Non-Islamic	0.6237	0.5925	0.1474	1.0000	0.3390	0.1570			
Islamic	0.4965	0.4880	0.2863	1.0000	0.0890	0.2815			
CRS – Overall									
Non-Islamic	0.8117	0.7860	0.1530	1.0000	0.5460	0.3180			
Islamic	0.7991	0.8830	0.2340	1.0000	0.3110	0.3500			
VRS - Customer–Community									
Non-Islamic	0.3609	0.2355	0.3298	1.0000	0.0130	0.5190	8%	86%	6%
Islamic	0.2591	0.0860	0.3412	1.0000	0.0240	0.2820	12%	65%	24%
VRS – Employee									
Non-Islamic	0.6985	0.6870	0.1827	1.0000	0.3560	0.2853	0%	99%	1%
Islamic	0.7993	0.8660	0.1740	1.0000	0.5490	0.3520	0%	82%	18%
VRS – Shareholder									
Non-Islamic	0.7990	0.7955	0.1242	1.0000	0.4170	0.1795	1%	93%	6%
Islamic	0.6561	0.7050	0.2912	1.0000	0.1140	0.6085	23%	59%	18%
VRS – Overall									
Non-Islamic	0.9062	0.9480	0.1027	1.0000	0.6680	0.1863	2%	71%	27%
Islamic	0.9132	0.9710	0.1264	1.0000	0.5970	0.1430	0%	67%	33%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

The results of the Kolmogorov–Smirnov test of the efficiency score distribution are reflected in Table 4.8. The results indicate that the scores are not normally distributed; therefore, the Mann–Whitney null hypothesis test is applied to determine whether the differences are statistically significant (Table 4.9).

Table 4-8 Kolmogorov–Smirnov test of normality for 2004 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.25	**0.00**	0.31	**0.00**
Customer–Community VRS	0.18	**0.00**	0.33	**0.00**
Employee CRS	0.24	**0.00**	0.41	**0.00**
Employee VRS	0.08	0.11	0.18	0.15
Shareholder CRS	0.13	**0.00**	0.18	0.13
Shareholder VRS	0.08	0.08	0.14	0.20
Overall CRS	0.16	**0.00**	0.21	**0.04**
Overall VRS	0.24	**0.00**	0.28	**0.00**

A benchmark *p*-value ≤ 0.05 is applied in this study, but the Customer–Community efficiency has a *p*-value of 0.06. This value is marginal but still regarded as a sufficient indicator of significant difference. Based on this standard, the following differences between non-Islamic and Islamic banks exist:

- The null hypothesis that the VRS for Customer–Community efficiency medians for Islamic and non-Islamic banks is equal can be rejected (*p*-value = 0.06). The median values reported in Table 4.7 are 0.2355 for non-Islamic banks and 0.0860 for Islamic banks; therefore, non-Islamic banks are more pure technical Customer– Community efficient than Islamic banks. Although the efficiency of non-Islamic banks exceeds that of Islamic banks, there are more Islamic banks operating at ORS (24%), fewer operating at DRS (65%) and more operating at IRS (12%).
- The null hypothesis that the VRS Employee efficiency medians for Islamic and non-Islamic banks are equal can be rejected (*p*-value = 0.05). The median values reported in Table 4.7 are 0.6870 for non-Islamic banks and 0.8660 for Islamic banks. Islamic banks are therefore more pure technically efficient in this regard. The number of Islamic banks operating at ORS is 18% compared

to 1% of non-Islamic banks. About 99% of non-Islamic banks operate at DRS while only 82% of Islamic banks do so.

- The null hypothesis that the median values for CRS Shareholder efficiency (*p*-value = 0.01) are equal can also be rejected. The median values reported in Table 4.7 are 0.5925 for non-Islamic banks and 0.4880 for Islamic banks. Non-Islamic banks are therefore currently more efficient in serving their shareholders.

Table 4-9 Mann–Whitney test for 2004 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.66	0.51	-1.87	**0.06**
Employee	Non-Islamic banks/ Islamic banks	-0.62	0.54	-1.95	**0.05**
Shareholder	Non-Islamic banks/ Islamic banks	-2.70	**0.01**	-1.66	0.10
Overall	Non-Islamic banks/ Islamic banks	-0.39	0.70	-0.37	0.71

4.3.3 Findings for 2005

The number of Islamic banks increased from 18 to 20 after 2004, while non-Islamic banks increased from 99 to 115. The descriptive statistics for inputs and outputs used for 2005 are contained in Table 4.10.

Table 4-10 Descriptive statistics of inputs and outputs for 2005

Bank	Mean	Median	Std. Dev	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	5,745,665	999,503	14,471,963	100,325,751	8,802	3,097,899
Islamic	777,631	91,152	1,910,899	7,050,140	0	428,382
Total Deposits (in Million IDR)						
Non-Islamic	9,454,912	1,315,076	26,515,668	199,037,097	11,560	5,107,385
Islamic	384,930	68,437	816,406	3,219,267	0	210,111
NIBTs (in Million IDR)						
Non-Islamic	274,547	39,168	786,892	5,605,991	-173,379	172,119
Islamic	12,533	297	45,433	156,254	-31,984	3,939

Table 4-110 Descriptive statistics of inputs and outputs for 2005 (continued)

Bank	Mean	Median	Std. Dev	Maximum	Minimum	Interquartile
Interest Income/ Total Assets						
Non-Islamic	0.0998	0.1000	0.0297	0.1947	0.0358	0.0398
Islamic	0.1046	0.0681	0.1555	0.7599	0.0106	0.0652
Income other than interest/ Total Assets						
Non-Islamic	0.0166	0.0107	0.0213	0.1338	0.0015	0.0107
Islamic	0.0245	0.0114	0.0372	0.1665	0.0001	0.0154
Employees						
Non-Islamic	1,973	390	5,437	37,375	26	760
Islamic	264	39	610	2,127	0	193
Branches						
Non-Islamic	121	17	470	4,653	1	46
Islamic	24	6	52	188	2	8
Personnel Expenses (in Million IDR)						
Non-Islamic	199,270	30,176	585,780	4,387,150	1,589	88,062
Islamic	18,579	3,944	38,536	152,577	3	12,696
Interest Expenses/ Total Assets						
Non-Islamic	0.0435	0.0439	0.0176	0.1117	0.0050	0.0266
Islamic	0.0265	0.0213	0.0217	0.0732	0.0000	0.0376
Expenses other than interest/ Total Assets						
Non-Islamic	0.0490	0.0457	0.0228	0.1277	0.0109	0.0245
Islamic	0.1115	0.0608	0.1868	0.8965	0.0016	0.0638

Note: Number of Islamic banks = 20 banks,
Number of non-Islamic banks = 115 banks

The input and output variables used in the DEA study to compare the efficiency of Islamic and non-Islamic banks in 2005 show some relative large changes compared to 2004:

- Islamic banks show a decrease in average loans, number of branches and employees in 2004, but in 2005 the respective growth is 79%, 85% and 61% for these variables. Non-Islamic banks that showed growth in these variables in 2004 experienced a comparatively low average growth of 11% in loans, a 4% decrease in branches, and a decrease of 4% in employees in 2005. This lower growth seems to result from the 16 new non-Islamic banks that entered the banking arena in the previous year, based on a review of the individual financial figures of all such banks.

- Notwithstanding the growth in the aforementioned variables, Islamic banks experienced a decrease in total deposits and non-interest income/ total assets.
- Non-Islamic banks showed decreases in average non-interest income/ total assets and net income before tax, against an increase in loans and total deposits.

The positive and negative changes in input and output variables indicate a high level of volatility for both bank types.

Table 4-121 Descriptive statistics of DEA results for 2005

Bank	Mean	Median	Std. Dev	Maxi	Min	Inter-quartile	IRS*	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.1994	0.0975	0.2481	1.0000	0.0080	0.1735			
Islamic	0.0920	0.0820	0.0692	0.2630	0.0140	0.0700			
CRS – Employee									
Non-Islamic	0.3857	0.3040	0.2453	1.0000	0.0400	0.3093			
Islamic	0.2804	0.2270	0.2315	1.0000	0.0090	0.2460			
CRS – Shareholder									
Non-Islamic	0.2777	0.2110	0.1879	1.0000	0.1020	0.1410			
Islamic	0.3085	0.2140	0.2575	1.0000	0.0660	0.2015			
CRS – Overall									
Non-Islamic	0.6337	0.6195	0.2822	1.0000	0.1970	0.6435			
Islamic	0.6486	0.6150	0.2830	1.0000	0.2480	0.5575			
VRS - Customer–Community									
Non-Islamic	0.3569	0.2195	0.3398	1.0000	0.0080	0.5183	10%	74%	17%
Islamic	0.1666	0.0940	0.2248	1.0000	0.0180	0.1345	38%	38%	24%
VRS – Employee									
Non-Islamic	0.6805	0.6475	0.1918	1.0000	0.3750	0.3138	0%	95%	5%
Islamic	0.7118	0.7080	0.2111	1.0000	0.4000	0.4365	0%	95%	5%
VRS – Shareholder									
Non-Islamic	0.7512	0.7425	0.1277	1.0000	0.4250	0.1835	0%	98%	2%
Islamic	0.6352	0.6350	0.2062	1.0000	0.2440	0.2590	5%	86%	10%
VRS – Overall									
Non-Islamic	0.8834	0.8970	0.1082	1.0000	0.5790	0.2163	2%	73%	25%
Islamic	0.8294	0.8470	0.1612	1.0000	0.5290	0.3055	5%	75%	20%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

All the average CRS and VRS efficiency scores (except CRS Employee efficiency) of both Islamic and non-Islamic banks decreased compared with 2004 (Table 4.11). This indicates that the efficiency of many banks of both types is low compared to those banks that are efficient, in terms of the DEA applied in 2005. Islamic banks showed higher decreases in CRS Customer–Community efficiency, VRS Customer–Community efficiency and VRS Overall efficiency than non-Islamic banks. The latter showed higher decreases in CRS Shareholder efficiency and CRS Overall efficiency.

Non-Islamic banks showed the best improvement in the average CRS Employee efficiency.

As in previous years, the different efficiency scores are not normally distributed (Table 4.12), and therefore the Mann–Whitney test is applied to determine the significance of the differences.

Table 4-13 Kolmogorov–Smirnov test of normality for 2005 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.23	**0.00**	0.19	**0.04**
Customer–Community VRS	0.19	**0.00**	0.29	**0.00**
Employee CRS	0.17	**0.00**	0.18	0.06
Employee VRS	0.14	**0.00**	0.18	0.07
Shareholder CRS	0.22	**0.00**	0.27	**0.00**
Shareholder VRS	0.06	0.20	0.13	0.20
Overall CRS	0.16	**0.00**	0.17	0.13
Overall VRS	0.19	**0.00**	0.18	0.09

The following statistical significant differences exist based on a *p*-value of ≤ 0.05 as benchmark (Table: 4.13):

- The null hypothesis that the medians for Islamic and non-Islamic banks (VRS for Customer–Community) are equal can be rejected (*p*-value = 0.01). The median values reported in Table 4.11 are 0.2195 for non-Islamic banks and 0.0940 for Islamic banks, so non-Islamic banks are more purely technically efficient in this measure. Notwithstanding this, the number of Islamic banks

operating at IRS increased from 12% in 2004 to 38% in 2005, while in the case of non-Islamic banks it only increased from 8% to 10%.

- The null hypothesis that the medians for Islamic and non-Islamic banks (CRS for Employee) are equal can be rejected (*p*-value = 0.04). The median values reported in Table 4.11 are 0.3040 for non-Islamic banks and 0.2270 for Islamic banks. Therefore, the existing efficiency of non-Islamic bank employees exceeds that of Islamic bank employees.
- The null hypothesis that the median values for Shareholder efficiency VRS (*p*-value = 0.00) are equal can be rejected. The median values reported in Table 4.11 are 0.7425 for non-Islamic banks and 0.6350 for Islamic banks. Thus the pure technical shareholder efficiency of non-Islamic banks exceeds that of Islamic banks. Like the Customer–Community pure technical efficiency finding, there are more Islamic banks operating at ORS (10%), more at IRS (5%) and less at DRS (86%) than non-Islamic banks (2% ORS, 0% IRS, and 98% DRS).

Table 4-143 Mann–Whitney test for 2005 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-1.55	0.12	-2.49	**0.01**
Employee	Non-Islamic banks/ Islamic banks	-2.02	**0.04**	-0.39	0.70
Shareholder	Non-Islamic banks/ Islamic banks	-0.29	0.78	-2.83	**0.00**
Overall	Non-Islamic banks/ Islamic banks	-0.05	0.96	-1.52	0.13

4.3.4 Findings for 2006

As in previous years, the number of Islamic banks increased. However, the number for which all required data on input and output variables was available in 2006 decreased, from 115 to 103 (Table 3.4). Of the 127 non-Islamic banks in Indonesia in 2006, the official website of Bank Indonesia provided financial statements for 105 (Table 3.2); and for two of these, the input and output variables were not available.

The Islamic banks had higher growth in total deposits, NIBT, number of employees, and number of branches than the non-Islamic banks over the period 2004–2006, at 104%, 87%, 68%, and 107% respectively. For non-Islamic banks total deposits increased by 34%, NIBT decreased by 1%, the number of employees decreased by 8% and branches increased by 10%. Apart from number of branches, increases and decreases were in the same direction for both types of bank.

Table 4-15 Descriptive statistics of inputs and outputs for 2006

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	7,241,455	1,411,698	16,966,671	109,379,723	8,058	4,999,045
Islamic	1,024,461	113,998	2,373,685	8,969,685	0	409,869
Total Deposits (in Million IDR)						
Non-Islamic	11,880,320	2,251,295	30,452,772	197,438,261	7,552	9,429,563
Islamic	903,734	139,326	2,154,509	8,219,273	6	378,759
NIBT (in Million IDR)						
Non-Islamic	359,754	59,301	930,525	6,025,635	-40,839	270,610
Islamic	16,501	1,391	38,826	161,473	-6,860	15,866
Interest Income/ Total Assets						
Non-Islamic	0.1111	0.1124	0.0274	0.1705	0.0462	0.0339
Islamic	0.1147	0.0950	0.1548	0.8137	0.0216	0.0395
Income other than interest/ Total Assets						
Non-Islamic	0.0130	0.0099	0.0114	0.0509	0.0007	0.0113
Islamic	0.0215	0.0156	0.0230	0.1025	0.0000	0.0212
Employees						
Non-Islamic	2,248	506	5,894	39,594	28	1,110
Islamic	266	53	591	2,167	0	225
Branches						
Non-Islamic	139	21	507	4,791	1	63
Islamic	27	6	59	212	2	9
Personnel Expenses (in Million IDR)						
Non-Islamic	245,604	38,961	660,446	4,792,320	2,010	134,795
Islamic	22,226	6,203	45,843	190,469	0	15,322
Interest Expenses/ Total Assets						
Non-Islamic	0.0576	0.0582	0.0228	0.1123	0.0067	0.0366
Islamic	0.0282	0.0277	0.0204	0.0684	0.0000	0.0358
Expenses other than interest/ Total Assets						
Non-Islamic	0.0454	0.0426	0.0211	0.1495	0.0088	0.0220
Islamic	0.1104	0.0614	0.2220	1.1211	0.0121	0.0296

Note: Number of Islamic banks = 23,
Number of non-Islamic banks = 103

All the average CRS and VRS efficiency scores, except the Employee efficiency scores, increased in 2006 compared to 2005. It is only in the case of the CRS and VRS Employee efficiency that the difference between individual bank efficiency increased, since many banks compared worse than the ones classified efficient in terms of DEA.

Table 4-15 Descriptive statistics of DEA results for 2006

Bank	Mean	Median	Std. Devi	Maxi	Min	Inter-quartile	IRS *	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.2647	0.1680	0.2628	1.0000	0.0050	0.2350			
Islamic	0.1581	0.1170	0.1969	1.0000	0.0220	0.1170			
CRS – Employee									
Non-Islamic	0.2878	0.2470	0.1873	1.0000	0.0230	0.2110			
Islamic	0.2860	0.1760	0.2909	1.0000	0.0040	0.2160			
CRS – Shareholder									
Non-Islamic	0.5049	0.4640	0.1354	1.0000	0.1920	0.1280			
Islamic	0.5652	0.4730	0.2216	1.0000	0.2610	0.2830			
CRS – Overall									
Non-Islamic	0.7572	0.7120	0.1870	1.0000	0.3650	0.4050			
Islamic	0.7872	0.8500	0.2067	1.0000	0.4360	0.3970			
VRS - Customer–Community									
Non-Islamic	0.4028	0.2960	0.3381	1.0000	0.0050	0.5920	16%	58%	26%
Islamic	0.1856	0.1220	0.2066	1.0000	0.0240	0.1150	30%	48%	21%
VRS – Employee									
Non-Islamic	0.5726	0.5160	0.2585	1.0000	0.1850	0.4450	0%	99%	1%
Islamic	0.5063	0.4670	0.2660	1.0000	0.1610	0.4310	0%	91%	9%
VRS – Shareholder									
Non-Islamic	0.8266	0.8240	0.1142	1.0000	0.4720	0.1400	0%	97%	3%
Islamic	0.7507	0.7270	0.1756	1.0000	0.4490	0.3480	12%	77%	12%
VRS – Overall									
Non-Islamic	0.9076	0.9330	0.1001	1.0000	0.4940	0.1770	3%	72%	25%
Islamic	0.8565	0.8900	0.1538	1.0000	0.4770	0.2820	9%	52%	39%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

The efficiency medians are not normal distributed, as indicated in the Kolgomorov–Smirnov test of normality results contained in Table 4.16.

Table 4-16 Kolmogorov–Smirnov test of normality for 2006 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.18	**0.00**	0.32	**0.00**
Customer–Community VRS	0.16	**0.00**	0.28	**0.00**
Employee CRS	0.14	**0.00**	0.25	**0.00**
Employee VRS	0.11	**0.00**	0.15	0.20
Shareholder CRS	0.15	**0.00**	0.20	**0.02**
Shareholder VRS	0.06	0.20	0.14	0.20
Overall CRS	0.16	**0.00**	0.20	**0.02**
Overall VRS	0.19	**0.00**	0.26	**0.00**
Overall Scale	0.18	**0.00**	0.27	**0.00**

Table 4.17 presents the results of the Mann–Whitney test of the null hypothesis that there is no difference between DEA medians for the non-Islamic and Islamic banks. The following statistical significant differences exist when applying a *p*-value of ≤ 0.05 as benchmark:

- The null hypothesis that the medians for Islamic and non-Islamic banks (CRS for Customer–Community) are equal can be rejected (*p*-value = 0.04). The median values reported in Table 4.15 are 0.1680 for non-Islamic banks and 0.1170 for Islamic banks, indicating that the prevailing Customer–Community efficiency of non-Islamic banks is better than that of Islamic banks.
- The null hypothesis that the medians for Islamic and non-Islamic banks (VRS for Customer–Community) are equal can be rejected (*p*-value = 0.01). The median values reported in Table 4.15 are 0.2960 for non-Islamic banks and 0.1220 for Islamic banks. This finding indicates that non-Islamic banks are more purely technically Customer–Community efficient than Islamic banks. This is supported by the previous finding that the CRS Customer–Community efficiency of non-Islamic banks is better than that of Islamic banks. Considering the changes in IRS, ORS, and DRS that both bank types experienced since 2005 the comparative position of non-Islamic banks improved, but more non-Islamic banks are operating at DRS (58% compared

to 48% of Islamic banks) and only 16% of non-Islamic banks are operating at IRS compared to 30% of Islamic banks.

- We can also reject the null hypothesis that the median values for Shareholder efficiency VRS (*p*-value = 0.03) are equal. The median values reported in Table 4.15 are 0.8240 for non-Islamic banks and 0.7270 for Islamic banks; suggesting that the purely technical efficiency of non-Islamic banks in serving their shareholders is better than that of Islamic banks. However, the situation in Islamic banks did improve (comparative to the non-Islamic banks) since the percentage operating at IRS increased and the number operating at DRS decreased.

Table 4-17 Mann–Whitney test for 2006 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-2.04	**0.04**	-2.63	**0.01**
Employee	Non-Islamic banks/ Islamic banks	-1.41	0.16	-1.18	0.24
Shareholder	Non-Islamic banks/ Islamic banks	-0.75	0.45	-2.13	**0.03**
Overall	Non-Islamic banks/ Islamic banks	-0.65	0.52	-1.15	0.25

4.3.5 Findings for 2007

In 2007 there are several notable changes in the input and output variables of both bank groups, as shown in Table 4.18. During the period 2006–2007, non-Islamic banks experienced growth in total deposits, NIBT, and number of branches of19.29%, 27.43%, and 4.93% respectively. The growth of Islamic banks was not as high in terms of total deposits and number of branches. In 2007, the average total deposit of Islamic banks increased by only 8.26%, while the average number of branches saw a decrease of 9.80%. The reasons for these changes are unclear since there were six more IBUs in 2007, while the number of non-Islamic banks remains the same. Despite their worse performance, the Islamic banks still maintained higher NIBT growth than the non-Islamic banks. The average NIBT of Islamic banks grew by 29.68%, while average interest income/ total assets for all banks decreased by

14.32% and 43.88% respectively. The decreases can be attributed to the 3.23% decrease in the interest rate imposed by Bank Indonesia (BI rate). In 2007 the BI rate was 8.60%, compared to 11.83% in the previous year (www.bi.go.id, 2012). The Islamic banks also experienced a decrease in non-interest income/ total assets of 16.25%, while the non-Islamic banks showed an increase in non-interest income/ total assets of 3.33%. However, the expenses/ assets ratios of both bank types decreased. The interest expenses/ total assets and non-interest expenses/ total assets ratios for non-Islamic banks decreased by 22.69% and 4.94% respectively. For Islamic banks, the same ratios decreased dramatically, by 17.67% and 48.39%. The comparatively high decrease in non-interest expenses/ total assets of Islamic banks seems to emanate from savings in decreasing branches.

The average relative CRS efficiency scores of both bank types decreased, with the exception of CRS Customer–Community efficiency of Islamic banks and CRS Shareholder efficiency of non-Islamic banks. For VRS efficiency measures, the non-Islamic banks experienced decreases in all efficiencies except Employee efficiency, while the Islamic banks showed positive trends in all VRS efficiency measures (Table 4.19). The average comparative efficiency of banks therefore still differs substantially, but it seems that size growth (based on outputs) would benefit Islamic banks more than non-Islamic banks. Large differences in the average CRS efficiency of Islamic and non-Islamic banks are not reflected in Table 4.19. Only the average VRS Customer–Community efficiency differs substantially, with non-Islamic banks showing an average 40.25% efficiency compared to 20.23% of Islamic banks.

Table 4-18 Descriptive statistics of inputs and outputs for 2007

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	9,357,450	1,968,257	21,129,308	126,826,445	4,154	6,796,405
Islamic	1,085,272	111,401	2,824,192	12,178,696	0	502,587
Total Deposits(in Million IDR)						
Non-Islamic	14,171,466	2,583,987	36,638,255	235,802,393	7,657	9,695,045
Islamic	978,406	137,436	2,543,643	11,105,978	0	551,513
NIBT (in Million IDR)						
Non-Islamic	458,444	71,057	1,201,615	7,760,475	-59,109	349,847
Islamic	21,398	2,554	52,669	212,038	-11,746	15,859
Interest Income/ Total Assets						
Non-Islamic	0.0952	0.0940	0.0248	0.1597	0.0271	0.0379
Islamic	0.0643	0.0553	0.0372	0.1502	0.0055	0.0550
Income other than interest/ Total Assets						
Non-Islamic	0.0134	0.0088	0.0127	0.0677	0.0008	0.0111
Islamic	0.0180	0.0148	0.0162	0.0653	0.0000	0.0184
Employees						
Non-Islamic	2,327	538	6,131	40,177	28	1,216
Islamic	283	36	672	3,003	0	181
Branches						
Non-Islamic	146	26	523	4,926	1	68
Islamic	24	3	62	270	2	8
Personnel Expenses (in Million IDR)						
Non-Islamic	298,150	48,261	777,842	5,226,457	1,862	195,733
Islamic	24,910	6,147	50,853	204,008	0	17,841
Interest Expenses/ Total Assets						
Non-Islamic	0.0445	0.0438	0.0150	0.0784	0.0063	0.0209
Islamic	0.0233	0.0194	0.0178	0.0741	0.0000	0.0295
Expenses other than interest/ Total Assets						
Non-Islamic	0.0432	0.0390	0.0253	0.2054	0.0089	0.0209
Islamic	0.0570	0.0469	0.0371	0.1832	0.0101	0.0396

Note: Number of Islamic banks = 29

Number of non-Islamic banks = 103

Table 4-19 Descriptive statistics of DEA results for 2007

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Inter-quartile	IRS*	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.2437	0.1375	0.2691	1.0000	0.0050	0.2013			
Islamic	0.2050	0.1120	0.2659	1.0000	0.0030	0.1435			
CRS – Employee									
Non-Islamic	0.1122	0.0615	0.1409	0.7840	0.0030	0.0895			
Islamic	0.1639	0.0580	0.2925	1.0000	0.0100	0.0700			
CRS – Shareholder									
Non-Islamic	0.5370	0.5050	0.1512	1.0000	0.1600	0.1373			
Islamic	0.5215	0.4650	0.2357	1.0000	0.0670	0.2175			
CRS – Overall									
Non-Islamic	0.7033	0.6520	0.2050	1.0000	0.3390	0.4110			
Islamic	0.7507	0.7110	0.2077	1.0000	0.3970	0.4385			
VRS - Customer–Community									
Non-Islamic	0.4025	0.2635	0.3445	1.0000	0.0050	0.6250	7%	80%	14%
Islamic	0.2023	0.1270	0.2398	1.0000	0.0000	0.1900	36%	39%	25%
VRS – Employee									
Non-Islamic	0.5809	0.5380	0.2640	1.0000	0.1540	0.4200	0%	100%	0%
Islamic	0.5722	0.5290	0.2727	1.0000	0.0940	0.4700	0%	90%	10%
VRS – Shareholder									
Non-Islamic	0.7587	0.7490	0.1323	1.0000	0.4340	0.1735	0%	95%	5%
Islamic	0.7759	0.8630	0.2287	1.0000	0.1350	0.4055	0%	90%	10%
VRS – Overall									
Non-Islamic	0.8751	0.8850	0.1195	1.0000	0.5610	0.2235	1%	76%	23%
Islamic	0.8951	1.0000	0.1317	1.0000	0.5670	0.2265	0%	68%	32%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

The Kolmogorov–Smirnov normality test for efficiency scores in 2007 indicates that the data is not normally distributed, as shown in Table 4.20

Table 4-20 Kolmogorov–Smirnov test of normality for 2007 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.22	**0.00**	0.28	**0.00**
Customer–Community VRS	0.17	**0.00**	0.24	**0.00**
Employee CRS	0.24	**0.00**	0.39	**0.00**
Employee VRS	0.13	**0.00**	0.09	0.20
Shareholder CRS	0.17	**0.00**	0.19	**0.01**
Shareholder VRS	0.06	0.20	0.18	0.02
Overall CRS	0.17	**0.00**	0.20	**0.01**
Overall VRS	0.21	**0.00**	0.30	**0.00**

Based on the Mann–Whitney test (Table 4.21), the null hypothesis that the medians of Islamic and non-Islamic banks for VRS Customer–Community efficiency are equal can be rejected (*p*-value = 0.01). The median values reported in Table 4.19 are 0.2635 for non-Islamic banks and 0.1270 for Islamic banks. This finding indicates that the comparative pure technical efficiency of non-Islamic banks was better than that of Islamic banks. The percentage of Islamic banks operating at IRS and ORS, however, increased, and fewer Islamic banks operated at DRS than in 2006. Non-Islamic banks showed opposite results; thus, although they have higher purely technical Customer–Community efficiency, Islamic banks are performing comparatively better than in 2006.

Table 4-21 Mann–Whitney test for 2007 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.95	0.34	-2.80	**0.01**
Employee	Non-Islamic banks/ Islamic banks	-0.26	0.80	-0.17	0.86
Shareholder	Non-Islamic banks/ Islamic banks	-1.37	0.17	-0.88	0.38
Overall	Non-Islamic banks/ Islamic banks	-1.18	0.24	-1.07	0.29

4.3.6 Findings for 2008

In 2008, the average NIBT of Islamic and non-Islamic banks decreased by 2.50% and 9.30% respectively (Table 4.22); all other variables increased, compared with 2007. Islamic banks showed growth in average loans (31.61%), total deposits (25.58%), interest income/ total assets (21.46%), non-interest income/ total assets (7.15%), interest expenses/ total assets (15.13%), non-interest expenses/ total assets (9.46%), number of employees (41.73%), and number of branches (36.11%). The non-Islamic banks' growth for the same variables was 17.15%, 4.25%, 8.89%, 0.33%, 2.58%, 29.10%, 7.04%, and 4.50%. The declining NIBT of both bank types results from the proportionally higher increase in interest expenses and non-interest expenses, compared with the increase in interest income and non-interest income.

Table 4.23 indicates that all CRS score averages decreased. This indicates that existing efficiency differences between banks were increasing, while the average VRS scores for Employee and Overall efficiency of both bank types and VRS Customer–Community efficiency of Islamic banks were increasing. It shows that both bank types improved in terms of comparable purely technical efficiency.

In contrast, VRS Customer–Community efficiency of the non-Islamic banks, and VRS Shareholder efficiency of both bank types decreased, indicating a downturn in the purely technical efficiency of these measures.

Table 4-22 Descriptive statistics of inputs and outputs for 2008

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	10,961,839	1,951,892	26,624,843	160,061,941	0	7,941,489
Islamic	1,428,284	237,581	3,510,148	15,753,835	10,706	945,353
Total Deposits (in Million IDR)						
Non-Islamic	14,774,282	2,262,747	40,597,308	273,565,821	4,306	9,680,216
Islamic	1,228,691	188,560	3,190,259	14,808,926	417	621,317
NIBT (in Million IDR)						
Non-Islamic	415,798	79,345	1,513,589	9,037,595	-6,634,604	348,214
Islamic	20,864	7,028	84,961	294,797	-214,264	22,229
Interest Income/ Total Assets						
Non-Islamic	0.1036	0.1033	0.0293	0.1750	0.0283	0.0389
Islamic	0.0782	0.0717	0.0335	0.0154	0.1824	0.0420
Income other than interest/ Total Assets						
Non-Islamic	0.0135	0.0087	0.0156	0.1003	0.0007	0.0091
Islamic	0.0193	0.0149	0.0156	0.0655	0.0026	0.0125
Employees						
Non-Islamic	2,491	531	7,106	54,032	28	1,234
Islamic	401	47	907	3,493	0	224
Branches						
Non-Islamic	152	29	550	5,337	1	72
Islamic	33	6	75	316	1	10
Personnel Expenses (in Million IDR)						
Non-Islamic	313,430	58,361	835,818	6,261,053	1,911	194,852
Islamic	27,586	7,431	59,463	294,252	0	17,082
Interest Expenses/ Total Assets						
Non-Islamic	0.0456	0.0445	0.0185	0.1053	0.0037	0.0270
Islamic	0.0268	0.0266	0.0163	0.0587	0.0000	0.0260
Expenses other than interest/ Total Assets						
Non-Islamic	0.0557	0.0456	0.0910	0.9787	0.0112	0.0223
Islamic	0.0624	0.0517	0.0718	0.4273	0.0003	0.0271

Note: Number of Islamic banks = 30,
Number of non-Islamic banks = 112

Table 4-23 Descriptive statistics of DEA results for 2008

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Inter-quartile	IRS*	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.1954	0.0970	0.2369	1.0000	0.0030	0.1433			
Islamic	0.1965	0.1075	0.2622	1.0000	0.0210	0.1570			
CRS – Employee									
Non-Islamic	0.0320	0.0160	0.0375	0.1690	0.0010	0.0240			
Islamic	0.1180	0.0185	0.2993	1.0000	0.0040	0.0235			
CRS – Shareholder									
Non-Islamic	0.4065	0.3765	0.1408	0.9620	0.0210	0.1160			
Islamic	0.3577	0.3000	0.2468	1.0000	0.0430	0.1168			
CRS – Overall									
Non-Islamic	0.5578	0.4600	0.2382	1.0000	0.1360	0.3300			
Islamic	0.5623	0.4895	0.2718	1.0000	0.1170	0.5038			
VRS - Customer–Community									
Non-Islamic	0.3380	0.2055	0.3162	1.0000	0.0030	0.4025	2%	89%	9%
Islamic	0.2508	0.1235	0.2956	1.0000	0.0370	0.2010	7%	67%	27%
VRS – Employee									
Non-Islamic	0.9173	0.9220	0.0804	1.0000	0.2960	0.0515	0%	100%	0%
Islamic	0.9636	0.9820	0.0387	1.0000	0.8710	0.0592	0%	90%	10%
VRS – Shareholder									
Non-Islamic	0.7432	0.7315	0.1363	1.0000	0.4450	0.1830	2%	98%	0%
Islamic	0.6576	0.6540	0.2074	1.0000	0.1330	0.2685	3%	87%	10%
VRS – Overall									
Non-Islamic	0.9578	0.9675	0.0525	0.6080	1.0000	0.0615	0%	85%	15%
Islamic	0.9778	0.9880	0.0283	0.8920	1.0120	0.0288	3%	80%	17%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

As in previous years, the efficiency scores of both bank types were not normally distributed, as shown on Table 4.24. The Mann–Whitney test was applied to evaluate the statistical significance of differences in the efficiency scores.

Table 4-24 Kolmogorov–Smirnov test of normality for 2008 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.25	**0.00**	0.31	**0.00**
Customer–Community VRS	0.18	**0.00**	0.29	**0.00**
Employee CRS	0.25	**0.00**	0.46	**0.00**
Employee VRS	0.19	**0.00**	0.20	**0.00**
Shareholder CRS	0.18	**0.00**	0.30	**0.00**
Shareholder VRS	0.04	0.20	0.11	0.20
Overall CRS	0.18	**0.00**	0.16	0.05
Overall VRS	0.21	**0.00**	0.18	**0.01**

The Mann–Whitney test (Table 4.25) returns the following results:

- The null hypothesis that the medians for Islamic and non-Islamic banks (VRS Employee efficiency) are equal can be rejected (*p*-value = 0.00). The median values reported in Table 4.23 are 0.9220 for non-Islamic banks and 0.9820 for Islamic banks. Therefore, Islamic banks' purely technical employee efficiency was comparatively better than that of the non-Islamic banks. This is supported by the fact that fewer Islamic banks operated at DRS (90% compared to 100% non-Islamic banks).
- The null hypothesis that the medians for Islamic and non-Islamic banks (CRS Shareholder efficiency) are equal can be rejected (*p*-value = 0.00). The median values reported in Table 4.23 are 0.3765 for non-Islamic banks and 0.3000 for Islamic banks. Non-Islamic banks are more efficient in this measure. This finding indicates that non-Islamic banks were, at this time, more efficient in serving their shareholders.
- The null hypothesis that the median for Islamic and non-Islamic banks (VRS Shareholder efficiency) are equal can be rejected (*p*-value = 0.02). The median values reported in Table 4.23 are 0.7315 for non-Islamic banks and 0.6540 for Islamic banks. Non-Islamic banks were more purely technically efficient in serving their shareholders. However, the percentage of Islamic banks operating at IRS and ORS were higher than non-Islamic banks, while the percentage operating under DRS was lower. This indicates that

notwithstanding the existing position of the better purely technical efficiency of non-Islamic banks, the position of Islamic banks can improve in future.

- The null hypothesis that the median values for Overall efficiency VRS (*p*-value = 0.05) are equal can also be rejected. The median values reported in Table 4.23 are 0.9675 for non-Islamic banks and 0.9880 for Islamic banks. This implies that Islamic banks are better in purely technical overall efficiency, a result consistent with the fact that the percentage of Islamic banks operating at IRS and ORS is higher than non-Islamic banks, while the percentage operating at DRS is lower.

Table 4-25 Mann–Whitney test for 2008 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.08	0.93	-1.42	0.15
Employee	Non-Islamic banks/ Islamic banks	-0.07	0.94	-3.65	**0.00**
Shareholder	Non-Islamic banks/ Islamic banks	-3.67	**0.00**	-2.37	**0.02**
Overall	Non-Islamic banks/ Islamic banks	-0.44	0.66	-1.99	**0.05**

4.3.7 Findings for 2009

The average NIBT figures of both Islamic and non-Islamic banks decreased in 2008 but increased in 2009 (Table 4.26). The average NIBT for Islamic banks increased by 20.55%, and that of non-Islamic banks by 36.87%. Islamic banks loans increased by 21.89% and those of non-Islamic banks by 19.38%. Average total deposits for Islamic banks decreased by 18.98% and those of non-Islamic banks by 21.18%. Interest income/ total assets slightly decreased for Islamic (1.91%) and non-Islamic (0.56%) banks, but non-interest income/ total assets increased for both groups (0.07% for Islamic banks and 15.61% for non-Islamic banks).

The interest expenses/ total assets of Islamic banks increased by 5.69%, but in non-Islamic banks decreased by 1.39%. The non-interest expenses/ total assets of Islamic and non-Islamic banks decreased by 19.12% and 13.06% respectively.

Table 4-26 Descriptive statistics of inputs and outputs for 2009

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	13,085,864	2,819,890	31,907,362	205,563,569	1,229	8,671,705
Islamic	1,740,970	293,672	4,041,860	19,042,611	0	1,348,562
Total Deposits (in Million IDR)						
Non-Islamic	17,903,325	2,841,029	48,067,556	299,721,940	3,555	10,553,403
Islamic	995,479	332,902	2,016,962	9,584,244	215	953,162
NIBT (in Million IDR)						
Non-Islamic	569,109	97,661	1,593,868	9,999,657	-75,447	386,821
Islamic	25,151	6,369	85,417	418,403	-186,509	32,553
Interest Income/ Total Assets						
Non-Islamic	0.1030	0.1052	0.0274	0.1654	0.0182	0.0360
Islamic	0.0767	0.0826	0.0341	0.1603	0.0032	0.0388
Income other than interest/ Total Assets						
Non-Islamic	0.0156	0.0095	0.0197	0.1296	0.0008	0.0112
Islamic	0.0193	0.0143	0.0195	0.0992	0.0012	0.0137
Employees						
Non-Islamic	2,807	609	8,079	65,152	21	1,396
Islamic	512	51	1,221	4,926	0	264
Branches						
Non-Islamic	185	34	666	6423	1	89
Islamic	41	5	93	363	1	20
Personnel Expenses (in Million IDR)						
Non-Islamic	374,989	68,955	930,541	6,587,462	1,994	236,553
Islamic	37,281	7,205	82,856	395,188	0	18,390
Interest Expenses/ Total Assets						
Non-Islamic	0.0450	0.0444	0.0175	0.0983	0.0027	0.0223
Islamic	0.0283	0.0234	0.0175	0.0728	0.0000	0.0250
Expenses other than interest/ Total Assets						
Non-Islamic	0.0485	0.0440	0.0262	0.2060	0.0114	0.0218
Islamic	0.0504	0.0514	0.0226	0.1023	0.0082	0.0346

Note: Number of Islamic banks = 31,
Number of non-Islamic banks = 107

Table 4.27 shows that most of the average CRS efficiency scores for both bank types increased, except for the CRS Customer–Community efficiency of Islamic banks and the CRS Employee efficiency of both groups. The level of CRS efficiency changes of Islamic banks exceeded that of non-Islamic banks. With an improvement in terms

of CRS Shareholder efficiency and CRS Overall efficiency but deterioration in CRS Employee efficiency. The most average and median VRS efficiency scores decreased compared to 2008, except for the VRS Customer–Community efficiency of non-Islamic banks and the VRS Shareholder efficiency of both groups. The biggest negative change relates to the VRS Employee efficiency of both Islamic and non-Islamic banks.

Table 4-27 Descriptive statistics of DEA results for 2009

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Inter-quartile	IRS*	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.2098	0.1120	0.2526	1.0000	0.0030	0.1380			
Islamic	0.1602	0.1210	0.1971	1.0000	0.0010	0.1260			
CRS – Employee									
Non-Islamic	0.0210	0.0120	0.0237	0.1040	0.0010	0.0150			
Islamic	0.0504	0.0150	0.1774	1.0000	0.0010	0.0170			
CRS – Shareholder									
Non-Islamic	0.4672	0.4220	0.1567	1.0000	0.1910	0.1380			
Islamic	0.5076	0.4160	0.2232	1.0000	0.2410	0.2010			
CRS – Overall									
Non-Islamic	0.5979	0.5250	0.2205	1.0000	0.3240	0.3040			
Islamic	0.6833	0.6290	0.2229	1.0000	0.3130	0.4600			
VRS - Customer–Community									
Non-Islamic	0.3484	0.2180	0.3256	1.0000	0.0030	0.4380	3%	90%	7%
Islamic	0.2074	0.1430	0.2082	1.0000	0.0010	0.1650	3%	84%	13%
VRS – Employee									
Non-Islamic	0.5757	0.5160	0.2292	1.0000	0.2910	0.3380	0%	100%	0%
Islamic	0.6957	0.7410	0.2071	1.0000	0.2370	0.3400	0%	97%	3%
VRS – Shareholder									
Non-Islamic	0.8044	0.7980	0.1246	1.0000	0.5400	0.1930	2%	94%	4%
Islamic	0.7342	0.7120	0.1815	1.0000	0.3930	0.3160	0%	90%	10%
VRS – Overall									
Non-Islamic	0.8840	0.8920	0.1108	1.0000	0.5980	0.2140	0%	82%	18%
Islamic	0.8744	0.8970	0.1326	1.0000	0.5160	0.2030	0%	74%	26%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

The Kolmogorov–Smirnov test of Normality for 2009 DEA scores shows that the data is not normally distributed (Table 4.28).

Table 4-28 Kolmogorov–Smirnov test of normality for 2009 DEA results

INPUT - OUTPUT	Non-Islamic banks		Islamic banks	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.27	**0.00**	0.26	**0.00**
Customer–Community VRS	0.20	**0.00**	0.22	**0.00**
Employee CRS	0.25	**0.00**	0.42	**0.00**
Employee VRS	0.15	**0.00**	0.13	0.18
Shareholder CRS	0.16	**0.00**	0.21	**0.00**
Shareholder VRS	0.10	**0.02**	0.11	0.20
Overall CRS	0.15	**0.00**	0.18	**0.01**
Overall VRS	0.21	**0.00**	0.17	**0.02**

The Mann–Whitney test was applied (Table 4.29) with the following results:

- The null hypothesis that the VRS medians for Islamic and non-Islamic bank Customer–Community efficiency are equal can be rejected. The *p*-value of 0.06 is marginal compared to the benchmark (*p*-value $\leq$ 0.05). The median values reported in Table 4.27 are 0.2180 for non-Islamic and 0.1430 for Islamic banks; This implies that non-Islamic banks are more purely technically efficient in serving Customer and Community stakeholders. Changes in IRS, ORS, and DRS since 2008 indicate that the position of non-Islamic banks improved substantially compared to Islamic banks: the differences in the percentage of each type of bank operating at IRS, ORS, and DRS reduced, to the benefit of non-Islamic banks.
- The null hypothesis that the VRS medians for Islamic and non-Islamic banks (for Employee efficiency) are equal can be rejected (*p*-value = 0.01). The median values reported in Table 4.27 are 0.5160 for non-Islamic and 0.7410 for Islamic banks, implying that the employees of Islamic banks are more purely technically efficient. Islamic banks retain this edge in efficiency despite comparative improvements in IRS, ORS, and DRS by non-Islamic banks.
- The null hypothesis that the VRS medians for Islamic and non-Islamic banks (for Shareholder efficiency) are equal can be rejected (*p*-value = 0.04). The

median values reported in Table 4.27 are 0.7980 for non-Islamic and 0.7120 for Islamic banks, indicating that non-Islamic banks are more purely technically efficient in serving their shareholders. The IRS, ORS and DRS statistics of non-Islamic banks show that notwithstanding their better purely technical efficiency, more Islamic banks are operating at ORS and fewer at DRS.

- We can also reject the null hypothesis that the median values for CRS Overall efficiency (*p*-value = 0.03) are equal. The median values reported in Table 4.27 are 0.6290 for non-Islamic and 0.5250 for Islamic banks, implying that Islamic banks are currently more efficient than non-Islamic banks, based on overall CRS efficiency measurement.

Table 4-29 Mann–Whitney test for 2009 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.90	0.37	-1.91	**0.06**
Employee	Non-Islamic banks/ Islamic banks	-0.08	0.93	-2.58	**0.01**
Shareholder	Non-Islamic banks/ Islamic banks	-0.27	0.79	-2.07	**0.04**
Overall	Non-Islamic banks/ Islamic banks	-2.20	**0.03**	-0.04	0.97

4.3.8 Findings for 2010

There were significant changes in 2010. In this year the number of Islamic commercial banks almost doubled, from six in 2009 to eleven in 2010, increasing the total of Islamic banks to 34. Their average total deposits increased dramatically (132.04% compared with 15.50% for non-Islamic banks, although the non-Islamic banks experienced a much higher increase in non-interest income/ total assets (121.49%, compared with 36.57% for Islamic banks). For both groups, all other input and output variables increased except for interest income/ total assets and interest expenses/ total assets (Table 4.30). Islamic banks showed growth in average loans of 36.36%, NIBT of 58.51%, non-interest expenses/ total assets of 12.30%, number of employees of 39.37%, and number of branches of 25.63%. For non-Islamic banks the growth for the respective variables are 18.37%, 20.66%, 37.08%, 11.22%, and

8.52%. In contrast, the average interest income/ total assets and interest expenses/ total assets of Islamic banks decreased 5.42% and 6.79% respectively, and that of non-Islamic banks decreased less (3.53% and 0.10% respectively). The decrease in interest income/ total assets and interest expenses/ total assets for both groups can be attributed to the decrease in interest rate (BI rate), from 7.15% in 2009 to 6.50% in 2010 (www.bi.go.id, 2012).

Table 4-30 Descriptive statistics of inputs and outputs for 2010

Bank	Mean	Median	Std. Deviation	Maximum	Minimum	Interquartile
Loans (in Million IDR)						
Non-Islamic	15,490,181	3,044,430	38,014,453	241,064,755	15,137	9,574,522
Islamic	2,373,953	411,335	5,696,662	28,539,540	1,510	1,685,132
Total Deposits (in Million IDR)						
Non-Islamic	20,679,036	3,301,959	55,560,210	332,727,856	14,405	10,368,944
Islamic	2,309,879	386,342	5,733,342	28,680,965	26,268	1,492,197
NIBT (in Million IDR)						
Non-Islamic	686,663	130,456	1,949,418	11,670,306	-274,688	387,026
Islamic	39,867	11,506	103,401	568,733	-30,812	32,371
Interest Income/ Total Assets						
Non-Islamic	0.0994	0.0949	0.0369	0.2083	0.0204	0.0568
Islamic	0.0725	0.0721	0.0311	0.1926	0.0072	0.0341
Income other than interest/ Total Assets						
Non-Islamic	0.0345	0.0136	0.1015	1.0183	0.0006	0.0178
Islamic	0.0263	0.0173	0.0321	0.1722	0.0046	0.0165
Employees						
Non-Islamic	3,122	693	9,395	75,712	30	1,443
Islamic	713	79	1,714	7,902	9	263
Branches						
Non-Islamic	201	40	722	7004	1	95
Islamic	52	10	120	507	2	21
Personnel Expenses (in Million IDR)						
Non-Islamic	400,607	87,383	975,054	6,811,989	2,085	265,998
Islamic	53,882	11,953	122,004	622,679	1,606	31,153
Interest Expenses/ Total Assets						
Non-Islamic	0.0450	0.0408	0.0230	0.1019	0.0031	0.0255
Islamic	0.0264	0.0228	0.0139	0.0617	0.0009	0.0179
Expenses other than interest/ Total Assets						
Non-Islamic	0.0664	0.0469	0.0972	0.9685	0.0076	0.0275
Islamic	0.0567	0.0476	0.0296	0.1516	0.0153	0.0271

Note: Number of Islamic banks = 34,
Number of non-Islamic banks = 109

Descriptive statistics of DEA scores (Table 4.31) show that all CRS efficiency measurements increased except for CRS Overall efficiency of Islamic banks. The

CRS Customer–Community and CRS Shareholder efficiency of non-Islamic banks increased more than that of Islamic banks. The CRS Overall efficiency of non-Islamic banks increased, while that of Islamic banks decreased. Applying VRS assumptions, Customer–Community and Employee efficiency of both banks increased.

Table 4-31 Descriptive statistics of DEA results for 2010

Bank	Mean	Median	Std. Dev	Max	Min	Inter-quartile	IRS*	DRS **	ORS ***
CRS - Customer–Community									
Non-Islamic	0.2248	0.1460	0.2362	1.0000	0.0110	0.1795			
Islamic	0.1693	0.1565	0.1124	0.4970	0.0130	0.1203			
CRS – Employee									
Non-Islamic	0.3878	0.3060	0.2483	1.0000	0.0740	0.2555			
Islamic	0.4590	0.3590	0.2463	1.0000	0.0950	0.3245			
CRS – Shareholder									
Non-Islamic	0.5056	0.4490	0.1674	1.0000	0.1920	0.1785			
Islamic	0.5379	0.4880	0.2061	1.0000	0.2780	0.2403			
CRS – Overall									
Non-Islamic	0.6471	0.6060	0.2060	1.0000	0.2480	0.3015			
Islamic	0.6717	0.6405	0.2059	1.0000	0.3780	0.2970			
VRS - Customer–Community									
Non-Islamic	0.3551	0.2230	0.3190	1.0000	0.0130	0.4080	10%	85%	5%
Islamic	0.2653	0.2055	0.2200	1.0000	0.0140	0.2155	59%	35%	6%
VRS – Employee									
Non-Islamic	0.6570	0.6150	0.2035	1.0000	0.1680	0.3145	0%	94%	6%
Islamic	0.7016	0.7075	0.1857	1.0000	0.2370	0.2695	0%	91%	9%
VRS – Shareholder									
Non-Islamic	0.7882	0.7940	0.1327	1.0000	0.4560	0.2130	1%	93%	6%
Islamic	0.7264	0.7190	0.1776	1.0000	0.3630	0.2915	0%	91%	9%
VRS – Overall									
Non-Islamic	0.8919	0.9210	0.1115	1.0000	0.5560	0.1815	1%	83%	17%
Islamic	0.8453	0.8415	0.1216	1.0000	0.6370	0.2083	0%	64%	14%

Note: * IRS: Increasing Returns to Scale

** DRS: Decreasing Returns to Scale

*** ORS: Optimum Return to Scale

Non-Islamic banks showed a higher increase in VRS Customer Community efficiency, while Islamic banks showed a higher increase in VRS Employee efficiency. Both bank groups experienced decreases in VRS Shareholder efficiency,

the largest by non-Islamic banks. In Overall VRS efficiency, Islamic banks experienced a decrease in average score, but non-Islamic banks had an increase.

The Kolmogorov–Smirnov test shows similar to the previous seven years, that the efficiency scores are not normally distributed (Table 4.32). Therefore, the Mann–Whitney test is also applied.

Table 4-32 Kolmogorov–Smirnov test of normality for 2010 DEA results

INPUT – OUTPUT	Non-Islamic banks		Islamic Bank s	
	Statistic	*p*-value	Statistic	*p*-value
Customer–Community CRS	0.24	**0.00**	0.15	0.05
Customer–Community VRS	0.18	**0.00**	0.16	**0.02**
Employee CRS	0.20	**0.00**	0.18	**0.01**
Employee VRS	0.12	**0.00**	0.08	0.20
Shareholder CRS	0.16	**0.00**	0.14	0.08
Shareholder VRS	0.09	**0.03**	0.09	0.20
Overall CRS	0.12	**0.00**	0.13	0.15
Overall VRS	0.19	**0.00**	0.12	0.20

The Mann–Whitney test (Table 4.33) shows the following statistically significant differences between the efficiency of Islamic and non-Islamic banks in Indonesia:

- The null hypothesis that the CRS medians for Islamic and non-Islamic banks for Employee efficiency are equal can be rejected (*p*-value = 0.04). The median values reported in Table 4.31 are 0.3060 for non-Islamic banks and 0.3590 for Islamic banks; therefore, the current employee efficiency of Islamic banks is better.
- The null hypothesis that the VRS medians for Islamic and non-Islamic banks for Shareholder efficiency are equal can be rejected, with a *p*-value of 0.06 that is marginal compared to the benchmark (*p*-value $\leq$ 0.05). The median values reported in Table 4.31 are 0.7940 for non-Islamic banks and 0.7190 for Islamic banks, implying that non-Islamic banks are more purely technically efficient. Although this difference exists, Islamic and non-Islamic banks show very little difference in actual IRS, ORS and DRS.
- The null hypothesis that the median values for VRS Overall efficiency (*p*-value = 0.03) are equal can be rejected. The median values reported in Table

4.31 are 0.9210 for non-Islamic banks and 0.8415 for Islamic banks; therefore, the overall purely technical efficiency of the non-Islamic banks is greater than that of the Islamic banks. There are 87% of non-Islamic banks operating at DRS, notwithstanding their purely technical leadership, and 64% of Islamic banks.

Table 4-33 Mann–Whitney test for 2010 DEA results

Stakeholder	Pair	CRS		VRS	
		Z	*p*-value (2-tailed)	Z	*p*-value (2-tailed)
Customer–Community	Non-Islamic banks/ Islamic banks	-0.05	0.96	-0.68	0.50
Employee	Non-Islamic banks/ Islamic banks	-2.06	**0.04**	-1.56	0.12
Shareholder	Non-Islamic banks/ Islamic banks	-0.30	0.77	-1.91	**0.06**
Overall	Non-Islamic banks/ Islamic banks	-0.65	0.52	-2.13	**0.03**

4.4 Regression analysis

The findings discussed in Section 4.3 show that there are differences between the efficiencies of Islamic and non-Islamic banks. In this section we consider whether the differences are associated with changes in total assets (that is, the growth of the banks). As noted in Section 3.11, this issue will be addressed utilising regression analysis results which will be provided in this section.

As described in Equations 3.7 and 3.8, the regression analysis in this research incorporates the percentage of changes for both dependent and independent variables. Table 4.34 shows that there are 829 banks, consisting of 154 Islamic banks and 675 non-Islamic banks. There is one missing VRS and 15 missing CRS efficiency measurement observations because DEA input/ output variables used in the regression have zero as denominator. The details of banks that are missing from the regression analysis are provided in Table 4.35.

Table 4-34 Number of observations for regression analysis

	All banks	Islamic banks	Non-Islamic banks
VRS	829	154	675
Less CRS observations where divisor equals zero	1	0	1
CRS	828	154	674
Less observations for variables used for DEA where divisor equals zero	15	15	0
Input-based regressions	813	139	674

Table 4-35 Details of missing observations for the regression analysis

Name	YEAR	ΔO_1	ΔO_2	ΔO_3	ΔO_4^*	ΔO_5^*	ΔI_1	ΔI_2	ΔI_3	ΔI_4^*	ΔI_5^*
BPD Banda Aceh (IBU)	2005								X		
BPD DIY (IBU)	2008						X		X		
BPD DIY (IBU)	2009						X		X		
BPD DIY (IBU)	2010								X		
BPD Jawa Timur (Jatim) (IBU)	2008						X				
BPD Kalimantan Barat (Kalbar) (IBU)	2006	X									
BPD Kalimantan Barat (Kalbar) (IBU)	2007						X				
BPD Kalimantan Selatan (Kalsel) (IBU)	2005								X		
BPD Kalimantan Timur (Kaltim) (IBU)	2007	X				X	X		X		
HSBC, Ltd. (IBU)	2006	X	X							X	
HSBC, Ltd. (IBU)	2007	X								X	
PT Bank Ekspor Indonesia (IBU)	2008	X	X			X	X		X	X	
PT Bank Permata (IBU)	2005								X		
PT Bank Sinarmas (IBU)	2010									X	
PT OCBC NISP (IBU)	2010	X								X	

Note:

X = the value is undefined because the denominator is zero.

O_1 = Total loans
O_2 = Total deposits
O_3 = NIBT
O_4* = Interest income
O_5* = Non-interest income

I_1 = Number of branches
I_2 = Number of employees
I_3 = Personnel expenses
I_4* = Interest expenses
I_5* = Non-interest expenses

4.4.1 Findings for Model 1

The results of the regression analysis for model 1 (Equation 3.7) indicate the impact of the changes in the annual relative efficiency scores of banks on the changes in their total assets. Table 4.36 contains the regression results of model 1 for the CRS efficiency measurements.

Among the Islamic banks, only changes in Employee efficiency is found to have a significant relationship with the changes of total assets. It is negative statistically significant, with a *p*-value of 0.0005 and an estimated coefficient of -0.0529. Changes in Employee efficiency have an inverse relationship with total assets, suggesting that it is gained at the cost of customer service and that this, in turn, reduces the rate of asset growth.

Table 4.36 also shows that the Employee CRS scores for non-Islamic banks are positively statistically significant, with a *p*-value of 0.0000, and an estimated coefficient of 0.4157.

Table 4-36 Model 1 regression results for panel A (CRS)

		Islamic	Non-Islamic
C	**Coefficient**	**0.9508**	**0.2135**
	t-Statistic	34.8304	38.3574
	P-value	**0.0000**	**0.0000**
ΔCC	**Coefficient**	0.4579	0.0496
	t-Statistic	1.9058	1.0800
	P-value	0.0593	0.2807
ΔEM	**Coefficient**	**-0.0529**	**0.4157**
	t-Statistic	-3.6144	4.9084
	P-value	**0.0005**	**0.0000**
ΔSH	**Coefficient**	-0.4426	0.0190
	t-Statistic	-1.6228	1.8004
	P-value	0.1075	0.0724
Number of observations		154	674
R-squared		0.5448	0.4499
Adjusted R-squared		0.3610	0.2255
F-statistic		2.9644	2.0050
***p*-value**		**0.0000**	**0.0000**

The significance implies a positive relationship between Employee efficiency and the change in total assets, and suggests that increasing CRS Employee efficiency in non-Islamic banks is aligned with an increase in assets. Comparing the regression analysis finding regarding Employee efficiency, it is evident that non-Islamic banks are less dependent than Islamic banks on providing employee-based customer service to achieve growth in total assets. The sensitivity to service level is consistent with the value that Islamic banks place on services, as stated on their vision and mission statements (see Section 3.4). We will explore this issue further with estimate model 2 (Equation 3.8 in Section 3.11) for non-Islamic banks.

The regression results of model 1, based on VRS efficiency scores, are presented in Table 4.37. For Islamic banks, Customer–Community and Shareholder efficiencies are statistically significant. Customer–Community VRS efficiency is positive statistically significant, with a *p*-value 0.0128 and an estimated coefficient of 0.2917. Shareholder VRS efficiency scores, however, are negatively statistically significant with a *p*-value of 0.0010 and an estimated coefficient of -1.0858. This Shareholder efficiency/ total assets relationship is similar to the inverse relationship of Employee efficiency and the growth of total assets uncovered in our analysis presented in Table 4.36. From a wider perspective it may be an indication that the growth of total assets of Islamic banks is a function of customer support based on intrinsic belief and not necessarily driven purely by economic considerations. The positive association with changes in the Customer–community VRS efficiency and the total asset growth of Islamic banks also support the importance of intrinsic belief, since social responsibility is reflected in Customer–Community efficiency.

Regression results for non-Islamic banks show that the Employee and Shareholder VRS efficiencies are statistically significant. The Employee VRS score is positively statistically significant, with a *p*-value of 0.0034 and an estimated coefficient of 1.0082. The positive relationship we find here is consistent with the positive relationship we found in Table 4.36, which we interpreted as increased efficiency resulting in growth in the total assets of non-Islamic banks; it is an indication that employee service to customers is not a particularly important element in attaining asset growth. The Shareholder VRS variable, negatively statistically significant with a *p*-value of 0.0058 and an estimated coefficient of -0.8652, also supports this view,

since Employee efficiency improves Shareholder efficiency (saving expenses). In contrast to Islamic banks, Customer and Community focus is not a significant factor for growth.

Table 4-37 Model 1 regression results for panel B (VRS)

		Islamic	Non-Islamic
C	Coefficient	**1.0596**	**0.1757**
	t-Statistic	28.4950	10.2190
	P-value	**0.0000**	**0.0000**
ΔCC	Coefficient	**0.2917**	0.0020
	t-Statistic	2.5311	1.6903
	P-value	**0.0128**	0.0916
ΔEM	Coefficient	-3.9842	**1.0082**
	t-Statistic	-0.8570	2.9395
	P-value	0.3933	**0.0034**
ΔSH	Coefficient	**-1.0858**	**-0.8612**
	t-Statistic	-3.3807	-2.7719
	P-value	**0.0010**	**0.0058**
Number of observations		154	675
R-squared		0.5185	0.4821
Adjusted R-squared		0.3241	0.2712
F-statistic		2.6672	2.2864
***p*-value**		0.0000	0.0000

Considering these contrasting findings, it is evident that the growth of non-Islamic banks is economically driven, in terms of stakeholder efficiency, while the growth of Islamic banks is more related to intrinsic beliefs and perspectives of customers and community.

Tables 4.36 and 4.37 show that Islamic banks have higher coefficients for the constant intercepts than their counterparts. This suggests that, assuming the different efficiency variables remain unchanged (that is, if all the inputs to the regression equal zero), Islamic banks will grow faster than non-Islamic banks. This is consistent with the higher documented growth rate of the Islamic banks, noted in Section 1.1; but, of course, it represents merely a possibility to be considered among the many implications emanating from the interpretation of the other independent variables.

4.4.2 Findings for Model 2

Changes in several efficiency measures have statistically significant relationships with changes in total assets. We noted in Sections 1.1 and Section 3.4 that there is a social (intrinsic) dimension to Islamic banks, and we interpreted the results in the previous section with this in mind. In this section we use the disaggregated input to the DEA scores to further explore our findings.

Table 4.38 presents the regression results of model 2 for Islamic and non-Islamic banks. Islamic banks have six statistically significant variables: number of employees (p-value = 0.0008), interest expenses (p-value = 0.0008), total loans (p-value = 0.0357), total deposits (p-value = 0.0003), interest income (p-value = 0.0000), and non-interest income (p-value = 0.0000). Estimated coefficients for the corresponding variables are 0.0514, -0.0816, 0.0809, 0.2942, 0.0565, and -0.0011 respectively. The number of employees, total loans, total deposits, and interest income are positively statistically significant, and interest expenses and non-interest income are negatively statistically significant.

The findings show that the number of employees has a positive relationship with the total assets of Islamic banks. This is consistent with the inverse employee efficiency found in Table 4.36, and supports our statement that employee service to customers is an important factor to facilitate the asset growth of Islamic banks.

Table 4.38 shows that interest income has a significant and positive correlation with the total assets of Islamic banks. The same applies to non-Islamic banks, but the coefficient for non-Islamic banks is 10 times higher. This aligns with the DEA findings that the shareholder efficiency scores of non-Islamic banks exceed those of Islamic banks, and that the latter are more customer- and community-driven. In addition, interest expenses and non-interest income show significant inverse relationships with the total assets of Islamic banks. The interest expense confirms the application of Islamic principles in the context of profit sharing instead of interest payments, as discussed in Chapter 2, combined with less profit (Shareholder efficiency) in terms of generating non-interest income.

Table 4-38 Model 2 regression results (parsimonious model)

		Islamic	Non-Islamic
C	Coefficient	0.0498	**0.0792**
	t-Statistic	0.3975	3.1312
	P-value	0.6920	**0.0018**
ΔNumber of Branches	Coefficient	-0.0777	0.0792
	t-Statistic	-1.6851	0.6704
	P-value	0.0954	0.5029
ΔNumber of Employees	Coefficient	**0.0514**	-0.0040
	t-Statistic	3.4777	-0.8401
	P-value	**0.0008**	0.4013
ΔPersonnel Expenses	Coefficient	0.0739	0.0046
	t-Statistic	1.2225	1.3128
	P-value	0.2246	0.1899
ΔInterest Expenses	Coefficient	**-0.0816**	0.0186
	t-Statistic	-3.4766	1.7548
	P-value	**0.0008**	0.0799
ΔNon-Interest Expenses	Coefficient	0.1329	-0.0045
	t-Statistic	1.7035	-0.8041
	P-value	0.0919	0.4217
ΔTotal loans	Coefficient	**0.0809**	
	t-Statistic	2.1312	
	P-value	**0.0357**	
ΔTotal deposits	Coefficient	**0.2942**	**0.000000214**
	t-Statistic	3.7158	6.4805
	P-value	**0.0003**	**0.0000**
ΔNIBT	Coefficient		
	t-Statistic		
	P-value		
ΔInterest income	Coefficient	**0.0565**	**0.6201**
	t-Statistic	8.3959	4.9864
	P-value	**0.0000**	**0.0000**
ΔNon-interest income	Coefficient	**-0.0011**	
	t-Statistic	-5.4002	
	P-value	**0.0000**	
Number of observations		154	675
R-squared		0.5185	0.4821
Adjusted R-squared		0.3241	0.2712
F-statistic		2.6672	2.2864
***p*-value**		**0.0000**	**0.0000**

The findings of model 1, based on the regression analysis of the DEA stakeholder efficiency scores, are supported by the findings based on the regression analysis applied to the actual input/ output variables used in the DEA analysis. The total asset growth of Islamic banks is hard to relate to economically-driven stakeholders and seems to align more readily with intrinsic belief, as reflected in Customer–Community efficiency.

4.5 Summary

This study measures the efficiency of Islamic and non-Islamic banks using both Constant Return to Scale (CRS) and Variable Return to Scale (VRS) DEA models. Applying the Mann–Whitney test, this research finds statistically significant differences between the efficiency scores of Islamic and non-Islamic banks. The differences in the CRS efficiency of the Islamic and non-Islamic banks (for the different stakeholders) are not consistent. The VRS efficiency differences between the banks are more pertinent with regard to Customer–Community and Shareholder efficiency, since statistical significant differences exist for five of the eight years under investigation. These scores for the non-Islamic banks exceed those of the Islamic banks. Employee efficiency in Islamic banks exceeded that of non-Islamic banks at a statistically significant level in three different years. A very interesting situation is that although the purely technical Customer–Community and shareholder efficiencies of non-Islamic banks exceed those of Islamic banks, more Islamic banks are operating at IRS and ORS, and less at DRS, than non-Islamic banks. This creates an expectation that the comparative future efficiency of Islamic banks can improve. However, during the different periods scrutinised in this study, leadership in Customer–Community and Shareholder purely technical efficiency was retained by non-Islamic banks.

From the regression analysis in Section 4.4, it is evident that for the CRS model, changes in Employee efficiency have significant impact on changes in total assets for both Islamic and non-Islamic banks. For Islamic banks, Employee efficiency shows an inverse correlation with total assets, but in non-Islamic banks is positively correlated with total assets. For the VRS model, changes in Customer–Community efficiency are significant and have a positive impact on changes in the total assets of Islamic banks, while Shareholder efficiency has an inverse correlation with total

assets. In contrast, changes in Employee efficiency and Shareholder efficiency are significantly linked to changes of total assets of non-Islamic banks, where Employee efficiency has positive correlation, and Shareholder efficiency a negative correlation to total assets.

Examining the input and output variables for all stakeholders, this study finds that changes in the number of employees, total loans, total deposits, and interest income are significant and positively correlated with changes of total assets for Islamic banks, but changes in interest expenses and non-interest income are also significant but have an inverse correlation with changes of total assets. For non-Islamic banks, changes in total deposits and interest income are significant and positively correlated to changes of total assets.

The findings from both DEA efficiency measurement and regression analysis suggest that Islamic banks differ from their non-Islamic counterparts. They give support to our contention that Islamic banks are not doing business only to maximise profits, but also observe a social function in serving their customers and community. In order to grow, Islamic banks have to act in ways that customers perceive to be consistent with their social aims. As the regression result suggests, the claim of Islamic banks that they focus on intermediation activities, as intermediary institutions between borrowers and depositors, is true.

Chapter 5
SUMMARY AND CONCLUSIONS

5.1 Summary

Islamic banking in Indonesia has grown rapidly, but at a much lower rate than predicted by the Central Bank of Indonesia (see Figure 1.4). The research undertaken in this study has investigated the growth of Indonesian Islamic banks to understand why they have not grown as predicted. The objectives were to determine whether Indonesian Islamic banks differ from non-Islamic banks in terms of efficiency with regard to the different groups of stakeholders that banks serve; to analyse the impact of efficiency differences on the total asset growth of these banks; and to determine the variables that significantly affect their growth.

The first part of the research consisted of a literature review that provided information about the growth of Islamic banking, globally and in Indonesia; and to investigate previous research into the efficiency measurement of Islamic banks. It was revealed that DEA is the most prominent method used to analyse the efficiency of Islamic banks, and this study therefore applied DEA analysis, along with regression analysis, to examine the efficiency and growth of Islamic banks in Indonesia. It was used to measure the stakeholder efficiency of all Islamic and non-Islamic banks in Indonesia, in contrast to the traditional intermediary and production approaches applied in previous research. The DEA findings, augmented by the regression results, provide a clear understanding of the efficiency differences between Islamic and non-Islamic banks, and that can be regarded as contributors to the slower than expected growth of the Islamic banks.

There are differences pertaining to the format and content of financial information provided by Islamic and non-Islamic banks (see Section 2.3). The financial reporting standards for non-Islamic banks are based on the International Financial Reporting Standards, while Islamic banks and financial institutions comply with AAIFI standards. There are also core operational differences between the two bank types. It was therefore required to map the financial report formats for both types of banks and adjusts figures in order to compare their financial information.

Previous research that applied DEA to measure Islamic bank efficiency and to compare Islamic bank efficiency with that of non-Islamic banks predominantly used intermediation and production approaches. This research incorporated a new approach, DEA efficiency measurement, focusing on the stakeholder efficiency of all banks. In addition, regression analysis was applied to determine the significance of the different components of stakeholder efficiency with regard to the growth of Islamic banking in Indonesia, to answer the question why the growth of Indonesian Islamic banks was below the expectation of the Indonesian Central Bank.

The DEA efficiency measurement was conducted for four stakeholders: Customers, the Community, Employees, and Shareholders. For each stakeholder, appropriate input and output variables were assigned. Since most of the variables are contained in the financial statements of banks, differences in the structure or content of their statements were addressed by aligning the structures for assets, liabilities, income and expenses, to provide similar, and therefore comparable, figures. The research also applied an acknowledged method of treating negative figures in order to apply DEA to them. However, a number of the non-Islamic banks are international banks, like HSBC, with branches in Indonesia. They presumably have centralised and cost efficient administration functions that are more proficient than that of domestic Indonesian banks, but this has not been considered in the research.

This study measured the efficiency of Islamic and non-Islamic banks using both CRS and VRS DEA models. The Kolmogorov–Smirnov test was applied to test the normality of the DEA results, followed by appropriate tests to determine the significance of the findings. Applying the Mann–Whitney test, enabled the discovery of statistical significant differences between the efficiency scores of Islamic and non-Islamic banks. The DEA analysis was augmented by regression analysis to determine whether the differences between the efficiency scores of Islamic and non-Islamic banks influenced the growth differences between them.

5.2 Findings and conclusions

VRS efficiency differences between the Islamic and non-Islamic banks are pertinent with regard to Customer–Community and Shareholder efficiency since statistically significant differences exist for five of the eight years under investigation. The

Customer–Community and Shareholder efficiency scores of non-Islamic banks exceed those of Islamic banks. The Employee efficiency of the Islamic banks exceeded that of non-Islamic banks statistically significant in three different years. A very interesting finding is that although the prevailing purely technical Customer–Community and shareholder efficiencies of non-Islamic banks exceed those of Islamic banks, more of them are operating at IRS and ORS, and less at DRS, than are non-Islamic banks. However, during the different periods scrutinised in this study, leadership in Customer–Community and Shareholder purely technical efficiency was retained by non-Islamic banks.

From the regression analysis, it is evident that for the CRS model, changes in Employee efficiency have a significant impact on changes in total assets for all banks. For Islamic banks, Employee efficiency has an inverse correlation with total assets; while in of non-Islamic banks it is positively correlated with total assets. For the VRS model, changes in Customer–Community efficiency are significant and have a positive impact on changes in the total assets of Islamic banks, while Shareholder efficiency has an inverse correlation. Changes in Employee efficiency and Shareholder efficiency are significant to the changes of total assets of non-Islamic banks: Employee efficiency has positive correlation, while Shareholder efficiency has negative correlation to total assets.

Examining the input and output variables for all stakeholders, this study found that changes in the number of employees, total loans, total deposits, and interest income are significant and positively correlated with the changes of total assets of Islamic banks, while changes in interest expenses and non-interest income are significant but are inversely correlated. For non-Islamic banks, changes in total deposits and interest income are significant and positively correlated to changes of total assets.

The findings from both DEA efficiency measurement and regression analysis show that Islamic banks are different from their non-Islamic counterparts. Islamic banks are doing business not only to maximise their profits, but to perform social functions by serving their customers and community. The findings suggest that in order to grow, Islamic banks have to act in ways that customers perceive to be consistent with these social aims. The regression results support the claim of Islamic banks that they focus on intermediation activities between borrowers and depositors.

Many of the Islamic banks are operating under DRS, and therefore expansion (growth) will not be to their benefit given the underlying efficiency issues contributing to their DRS performance. The attempts of Bank Indonesia to improve the growth of Islamic banks by increasing the number of outlets through office channelling is probably not efficient in light of the existing DRS performance of the majority of Islamic banks. These findings indicate that Islamic banks should improve their efficiency to enable sustainable growth that is not subject to DRS performance.

REFERENCES

Afiatun, P 2010, 'Efficiency, productivity, and risk analysis of Indonesian Islamic banking', Master, Institut Teknologi Bandung.

Ahmad, NH & Noor, MANM 2011, 'The determinants efficiency and profitability of world Islamic Banks', *Proceedings of the 2010 International Conference on E-business, Management and Economics,* IACSIT, Hong Kong.

Ahmad, NHB, Noor, MANM & Sufian, F 2010, 'Measuring Islamic banks efficiency: the case of world Islamic banking sectors.', *Working Paper*.

Ahmad, S & Rahman, ARA 2012, 'The efficiency of Islamic and conventional commercial banks in Malaysia', *International Journal of Islamic and Middle Eastern Finance and Management,* vol. 5, pp. 241–263.

Akaike, H 1973, 'Information theory and an extension of the maximum likelihood principle', in *Proceedings of the Second International Symposium on Information Theory,* eds BN Petrov & F Csaki, Akademiai Kiado, Budapest.

Al-Delaimi, KSK & Al-Ani, AHB 2006, 'Using data envelopment analysis to measure cost efficiency with an application on Islamic banks', *Scientific Journal of Administrative Development,* vol. 4, pp. 134-156.

Al-Khasawneh, JA, Bassedat, K, Aktan, B & Thapa, PDP 2012, 'Efficiency of Islamic banks: the case of North African Arab countries', *Qualitative Research in Financial Markets,* vol. 4, pp. 228–239.

Ali, AI & Seiford, LM 1990, 'Translation in variance in data envelopment analysis', *Operations Research Letters,* vol. 9, 403–405.

Ali, AY 2000, *(translation of) The Holy Qur'an*, Wordsworth, place.

Aliludin, A 1990, Standarisasi tingkat pembagian keuntungan usaha bersama yang bersifat massal dan dinamis: analisis konseptual terhadap riba dan bunga bank dengan pendekatan hukum Islam dan manajemen industri, Bachelor, Universitas Islam Bandung.

Antonio, MS 2001, Bank syariah: dari teori ke praktik, Gema Insani Press, Jakarta.

Ariff, M 1988, 'Introduction', in *Islamic banking in Southeast Asia: Islam and the economic development of Southeast Asia*, ed. M Ariff, Institute of Southeast Asian Studies, Singapore, pp. 1-4.

Ascarya & Yumanita, D 2005, Bank Syariah: Gambaran Umum.

Ascarya & Yumanita, D 2007, 'Measuring the Competitiveness of Islamic Banking in Indonesia', *Working Paper*.

Ascarya, Yumanita, D, Achsani, NA & Rokhimah, GS 2010, 'Measuring the efficiency of Islamic Banks in Indonesia and Malaysia using parametric and nonparametric approaches', paper presented at the *3rd International Conference on Islamic Banking and Finance, SBP-IRTI*, Jakarta.

Bader, MKI, Mohamad, S, Ariff, M & Hassan, T 2008, 'Cost, revenue, and profit efficiency of Islamic versus conventional banks: international evidence using data envelopment analysis', *Islamic Economic Studies*, vol. 15, pp. 23–76.

Bank Indonesia 2003, 'Islamic Banking Statistics December 2003', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2004, 'Indonesian Banking Statistics December 2004', Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2004, 'Islamic Banking Statistics December 2004', Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2005, 'Indonesian Banking Statistics December 2005', Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2005, ‘Islamic Banking Statistics December 2005’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2006, ‘Indonesian Banking Statistics December 2006’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2006, ‘Islamic Banking Statistics December 2006’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2007, ‘Indonesian Banking Statistics December 2007’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2007, ‘Islamic Banking Statistics December 2007’, Directorate of Islamic Banking Bank Indonesia, Jakarta.Bank Indonesia 2008, Bank Indonesia Regulation Number 10/ 11 / PBI/ 2008.

Bank Indonesia 2008, ‘Codification of Islamic banking products’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2008, ‘Indonesian Banking Statistics December 2008’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2008, ‘Islamic Banking Statistics December 2008’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2009, ‘Indonesian Banking Statistics December 2009’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2009, ‘Islamic Banking Statistics December 2009’, Directorate of Islamic Banking Bank Indonesi, Jakarta a.

Bank Indonesia 2010, ‘Indonesian Banking Statistics December 2010’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2010, ‘Islamic Banking Statistics December 2010’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2011, ‘Indonesian Banking Statistics December 2011’, Directorate of Bank Licensing and Banking Information Bank Indonesia, Jakarta.

Bank Indonesia 2011, ‘Islamic Banking Statistics December 2011’, Directorate of Islamic Banking Bank Indonesia, Jakarta.

Bank Indonesia 2012, *Islamic banking in Indonesia in brief.* Available <http://www.bi.go.id/ web/ en/ Perbankan/ Perbankan+Syariah/> [20 February 2012].

Badan Pusat Statistik 2010, *Penduduk Menurut Kelompok Umur dan Agama yang Dianut* [Online], Available: <http://sp2010.bps.go.id/index.php/site/tabel?tid=320&wid=0> [7 September 2012].

Banker, RD, Charnes, A & Cooper, WW 1984, ‘Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science,* vol. 30, pp. 1078-1092.

Bart, CK, Bontis, N & Taggar, S 2001, ‘A model of the impact of mission statements on firm performance’, *Management Decision,*vol. 39, pp. 19–35.

Bartkus, BR, Glassman, M & McAfee, RB 2004, ‘A comparison of the quality of European, Japanese and US mission statements: a content analysis’, *European Management Journal,* vol. 22, pp. 393–401.

Batchelor, VB & Wadud, IKMM 2004, ‘Technical and scale efficiency of Islamic banking operations in Malaysia: an empirical investigation with a longitudinal perspective’, *Labuan Bulletin of International Business & Finance,* vol. 2, pp. 51-69.

Bauer, PW, Berger, AN, Ferrier, GD & Humphrey, DB 1998, ‘Consistency conditions for regulatory analysis of financial institutions: a comparison of frontier efficiency methods’, *Journal of Economics and Business*, vol. 50, pp. 85–114.

Beck, T, Demirgüç-Kunt, A & Merrouche, O 2013, 'Islamic vs, conventional banking: business model, efficiency and stability', *Journal of Banking & Finance,* vol. 37, pp. 433–447.

Boatright, JR 2006, 'What's wrong and what's right with stakeholder management', *Journal of Private Enterprise,* vol. 21, pp. 106-130.

Canhoto, A & Dermine, J 2003, 'A note on banking efficiency in Portugal, new vs. old banks', *Journal of Banking & Finance*, vol. 27, pp. 2087–2098.

Carpenter, M, Bauer, T & Erdogan, B 2009, *Principles of management*, Flat World Knowledge, New York.

Charnes, A, Cooper, WW & Rhodes, E 1978, 'Measuring the efficiency of decision making units', *European Journal of Operational Research*, vol. 2, pp. 429-444.

Coelli, T 1996, 'A Guide to DEAP Version 2.1: a data envelopment analysis (computer) program', *CEPA Working Paper*.

Cronje, J & Mutezo, A 2000, 'Data envelopment analysis as a measure for technical efficiency measurement in banking - a research framework', *Working Paper*.

Cullinane, K, Ji, P & Wang, T-F 2005, 'The relationship between privatization and DEA estimates of efficiency in the container port industry', *Journal of Economics and Business,* vol. 57, pp. 433-462.

Farrell, MJ 1957, 'The measurement of productive efficiency', *Journal of the Royal Statistical Society. Series A (General)*, vol. 120**,** pp. 253-290

Favero, CA & Papi, L 1995, 'Technical efficiency and scale efficiency in the Italian banking sector: a non-parametric approach', *Applied Economics,* vol. 27, pp. 385-395.

Gharleghi, E, Nikbakht, F & Bahar, G 2011, 'A Survey of the relationship between the characteristics of mission statement and organizational performance', *Research Journal of Business Management*, vol. 5, pp. 117-124.

Greene, WH 2003, *Econometric Analysis 5th edition*, Prentice Hall, New Jersey.

Hadad, MD, Hall, MJB, Kenjegalieva, KA, Santoso, W & Simper, R 2012, 'A new approach to dealing with negative numbers in efficiency analysis: an application to the Indonesian banking sector', *Expert Systems with Applications,* vol. 39, pp. 8212–8219.

Haque, A & Tariq, A 2012, 'Efficiency of banks in Pakistan: a non parametric approach', *Business & Economic Research (BER),* vol. 2, pp. 1–12.

Hassan, T, Mohamad, S & Bader, MKI 2009, 'Efficiency of conventional versus Islamic banks: evidence from the Middle East', *International Journal of Islamic and Middle Eastern Finance and Management,* vol. 2, pp. 46–65.

Hegazy, WS 2007, 'Contemporary Islamic finance: from sosioeconomic idealism to pure legalism', *Chicago Journal of International Law,* vol. 7, pp. 581-601.

Ibrahim, SHM 2007, 'IFRS vs AAOIFI: the clash of standards?' *Working Paper*.

Ika, SR & Abdullah, N 2011, 'A comparative study of financial performance of Islamic banks and conventional banks in Indonesia', *International Journal of Business & Social Science,* vol. 2, pp. 199–207.

Ikatan Akuntan Indonesia 2003, *Pedoman Akuntansi Perbankan Syariah Indonesia 2003*, Biro Perbankan Syariah, Bank Indonesia.

Investopedia [Online]. Available: <http://www.investopedia.com/terms/a/agio.asp> [9 November 2013]

Islamic Development Bank 2010, *Islamic Development Bank Annual Report 1431H* (2010).

Islamic Finance [Online]. Available: <http://zouine-anass.blog4ever.com/blog/lirarticle-261664-1048783.html> [9 November 2013].

Islamic Financial Services Board 2013, *Islamic Financial Services Industry Stability Report 2013* (2013)

Kahf, M 2004, 'Islamic banks: the rise of a new power alliance of wealth and *shari'a* scholarship', in *The Politics of Islamic Finance*, eds CM Henry & R Wilson, Edinburgh, Edinburgh University Press.

Kamaruddin, BH, Safa, MM & Mohd, R 2008, 'Assessing production efficiency of Islamic banks and conventional bank Islamic windows in Malaysia', *International Journal of Business and Management Science*, vol. 1, pp. 31-48.

Karim, A 2004, *Bank Islam analisis fiqih dan keuangan*, Jakarta, PT, Raja Grafindo Persada.

Karim, RAA 2001, 'International accounting harmonization, banking regulation, and Islamic banks', *The International Journal of Accounting*, vol. 36, pp. 169-193.

Kashani, HA & Obay, LA 2010, 'An analysis of productivity change: are UAE banks operating efficiently when compared to GCC banks?' *Academy of Banking Studies Journal,* vol. 9, pp. 13–38.

Lewis, MK & Algaoud, LM 2001, *Islamic banking*, Edward Elgar, Cheltenham.

Miniaoui, H & Tchantchane, A 2010, 'Investigating efficiency of GCC banks: a non-parametric approach', *The Business Review Cambridge,* vol. 14, no. 2, pp. 78–84.

Mokhtar, HSA, Abdullah, N & Alhabshi, SM 2008, 'Efficiency and competition of Islamic banking in Malaysia', *Humanomics*, vol. 24, pp. 28-48.

Mostafa, MM 2011, 'Modeling Islamic banks' efficiency: a non-parametric frontier approach', *International Journal of Islamic and Middle Eastern Finance and Management*, vol. 4, pp. 7–29.

Moussawi, CE & Obeid, H 2010, 'Evaluating the productive efficiency of Islamic banking in GCC: a non parametric approach', *International Research Journal of Finance and Economics*, no. 53, pp. 178-190

Muslim Population Worldwide Data [Online]. Available: <http://www.muslimpopulation.com/ world/> [7 September 2012].

Noor, MANM & Ahmad, NHB 2012, 'The determinants of Islamic banks' efficiency changes: empirical evidence from the world banking sectors', *Global Business Review*, vol. 13, pp. 179-200.

Olson, D & Zoubi, TA 2008, 'Using accounting ratios to distinguish between Islamic and conventional banks in the GCC region', *The International Journal of Accounting*, vol. 43, pp. 45–65.

Pastor, JT 1996, 'Chapter 3 translation invariance in data envelopment analysis: a generalization', *Annals of Operations* Research, vol. 66, pp. 91–102.

Pramuka, BA 2011, 'Assessing profit efficiency of Islamic banks in Indonesia: an intermediation approach', *Journal of Economics, Business and Accountancy Ventura*, vol. 14, no. 1, pp. 79–88.

PT. Bank Muamalat Indonesia. Available <http://www.muamalatbank.com/home/about/visi_misi> [19 September 2011].

Rahardjo, MD 1988, 'The question of Islamic banking in Indonesia', in *Islamic banking in Southeast Asi : Islam and the economic development of Southeast Asia*, ed. M Ariff, Institute of Southeast Asian Studies, Singapore, pp. 137-163.

Said, A 2012a, 'Comparing the change in efficiency of the western and Islamic banking systems', *Journal of Money, Investment and Banking*, no. 23, pp. 149-180.

Said, A 2012b, 'Efficiency in Islamic banking during a financial crisis an empirical analysis of forty-seven banks', *Journal of Applied Finance & Banking*, vol. 2, no. 3, pp. 163-197.

Said, A 2013, 'Risks and efficiency in the Islamic banking systems: the case of selected Islamic banks in MENA region', *International Journal of Economics and Financial Issues*, vol. 3, no. 1, pp. 66-73.

Sealey, C & Lindley, J T 1977, 'Inputs, outputs and a theory of production and cost at depository financial institutions', *Journal of Finance,* vol. 32**,** pp. 1251–1266.

Shah, IA, Shah, SZA & Ahmad, H 2012, 'Comparing the efficiency of Islamic versus conventional banking: through data envelopment analysis (DEA) model', *African Journal of Business Management,* vol. 6, no. 3, pp. 787-798.

Siegel, S & Castellan, NJ 1988, *Nonparametric statistics for the behavioral sciences,* McGraw-Hill, Singapore.

Solé, J 2007, 'Introducing Islamic banks into conventional banking systems', *IMF Working Paper,* WP/ 07/ 175.

Sufian, F 2006 & 2007, 'The efficiency of Islamic banking industry: a nonparametric analysis with nondiscretionary input variable', *Islamic Economic Studies,* vol. 14, pp. 53-78.

Sufian, F & Noor, MANM 2009, 'The determinants of Islamic banks' efficiency changes empirical evidence from the MENA and Asian banking sectors', *International Journal of Islamic and Middle Eastern Finance and Management,* vol. 2, no. 2, pp. 120-138.

Sufian, F, Noor, MAM & Majid, M.-ZA 2008, 'The efficiency of Islamic banks: empirical evidence from the MENA and Asian countries Islamic banking sectors', *The Middle East Business and Economic Review,* vol. 20, no. 1, pp. 1-19.

Tahir, IM, Bakar, NMA & Haron, S 2011, 'Evaluating efficiency of Islamic banks using data envelopment analysis: international evidence', *Journal of Islamic Economics, Banking and Finance,* vol. 7, no. 1, pp. 11-24.

Visser, H 2009, *Islamic finance: principles and practice*, Edward Elgar, Cheltenham.

Warde, I 2000, *Islamic finance in the global economy*, Edinburgh University Press, Edinburgh.

Wheelock, DC & Wilson, PW 1995, 'Evaluating the efficiency of commercial banks: does our view of what banks do matter?' *Review - Federal Reserve Bank of St, Louis,* vol. 77, pp. 39–52.

Williams, LS 2008, 'The mission statement: a corporate reporting tool with a past, present, and future', *Journal of Business Communication,* vol. 45, no. 2, pp. 94-119.

Yahya, MH, Muhammad, J, & Hadi, ARA 2012, 'A comparative study on the level of efficiency between Islamic and conventional banking systems in Malaysia', *International Journal of Islamic and Middle Eastern Finance and Management*, vol. 5, pp. 48–62.

Yaumidin, UK 2007, 'Efficiency in Islamic banking: a non-parametric approach', *Buletin Ekonomi Moneter dan Perbankan,* pp. 23-54.

Yudistira, D 2003, 'Efficiency in Islamic banking: an empirical analysis', *Paper*, Loughborough University, United Kingdom.